ELECTRONICS Australia

with CB and HIFI NEWS

AUGUST, 1977

AUST. $1.25*, NZ $1.25

SPECIAL CB FEATURES

AUSTRALIAN SURGEONS USING LASER—SEE INSIDE

NEW SPEAKER DESIGN, LIFE EXTENDER FOR DRIVING LAMPS

Introducing ELCASET!
World's newest tape format

True open reel performance.

You want the highest quality sound. Right? You also want cassette convenience. Right?

Meet Sony Elcaset, the world's newest tape format and the first to give you both.

It's simply the nearest thing yet to sound perfection in an easy tape package. It's an entirely new type of cassette and player system which moves twice as much tape, twice as fast as a standard cassette for a performance that truly rivals the best in reel-to-reel.

Always something new from Sony

Our restless search for something better has given the world some products that have truly revolutionised sound and sight.

And in the case of Elcaset, it's backed by a consortium of Japan's leading electronics manufacturers.

Much more than a bigger cassette

In developing Elcaset we took the bugs out of the standard cassette system. To do so we utilised the superior tape transport system of videotape. The tape is actually removed from the case for better alignment and tape to head contact—3.3 times more per second!

The tape comes with three other dramatic improvements: • Reel hub locks to prevent tape spill • Permanent, in-place, anti-erase tabs • Another most amazing of all—Elcaset tape comes with its own built-in detectors that automatically set bias and equalisation and Dolby noise reduction.

Tape is freely available, including Sony's famous double-coated FeCr.

Elcaset is sensational. Elcaset is a major step forward.

Elcaset *is* the future of Hi-Fi in tape.

As *"Hi-Fi Review"* said (November '76)
"The format as represented by the EL-7 is an ideal one for home use, with obvious performance superiority compared with even the best compact cassettes, yet without the fiddle of open reel . . .
. . . The Elcaset has enormous potential for listeners seeking both top quality sound and convenience."

And *"Electronics Today—International"* (December '76)
"The Sony EL-7 was judged to be a very good performer, and certainly convinced us that the Elcaset format is a welcome introduction to the Hi-Fi field . . . the Elcaset system is likely to have enormous appeal to critical Hi-Fi enthusiasts."

Main Features: EL-5 Elcaset Deck $795

• Front loading vertical cassette • DC servo motor • Feather touch logic controls with optional remote • Dolby* NR System • 3 position bias and equalisation selectors • Line mike mixing • Soft eject cassette lid • Punch in recording • Optical auto shut-off • Timer activator control.

EL-7 Elcaset Deck $1225

• Front loading vertical cassette • DC servo motor for capstan • Feather touch logic controls with optional remote • Dolby* NR System • 3 position bias and equalisation selectors • Three motors • Three heads • Line mike mixing • Soft eject cassette lid • Punch in recording • Optical auto shut-off • Timer activator control • Closed loop dual capstan drive

Performance:	**EL-5**	**EL-7**
Signal to noise:	62db (FeCr) Dolby off	62db FeCr
Frequency response:	25Hz-20kHz (FeCr)	25Hz-22kHz (FeCr)
Wow and flutter:	.06% (WRMS)	0.04% (WRMS)
Total Harmonic Distortion:	.8%	.8%

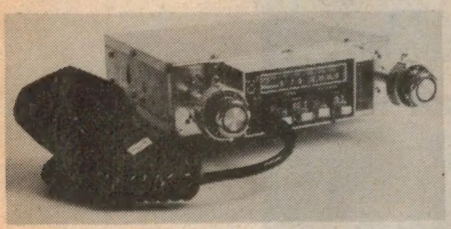
When someone beats Sony it's always SONY®

GAC.S.7920R **Research makes the difference.**

ELECTRONICS Australia

Australia's largest selling electronics & hi-fi magazine

The Australian CB SCENE



On page 35 this month, we commence a regular new monthly feature: "The Australian CB Scene". We begin by taking a critical look at the reaction of the ATDA (Australian Telecommunications Development Association) to the legalisation of CB radio, and by reviewing the Royce model 1-614 (pictured), a complete 23-channel AM transceiver integrated with an AM/FM stereo receiver.

Intended for use with teleprinters and video display terminals, this test message generator is capable of generating both ASCII and Baudot codes at varying baud rates. Full project description on p.64.

CONTENTS—AUGUST, 1977 VOLUME 39 No 5

Editorial: Further reflections on the energy crisis 3
News highlights 4
Operation telegraph: an intriguing story from Australia's past 10
Cover Feature: The laser—its place in modern surgery 12
How the CSIRO measures high voltages 18
Forum: We say it just to please our masters! 20
HiFi Product Review: Pioneer SA-9500II stereo amplifier 24
HiFi News:
"De-click" your phono records with the SAE 5000—Super loudspeaker?—Replacement stylii from EEI—Gauss brand loudspeakers—HiFi news briefs—Pioneer car speakers 27
HiFi Product Review: Micro-Seiki DD-40 turntable 33
The Australian CB Scene:
Is the ATDA having itself on about UHF?—Power driven radio/CB antenna—TASC TM-1100 CB transceiver—Royce CB transceiver car radio 1-614—Provisional CB regulations summarised 44
A universal loudspeaker system for cassette players and radios 48
A low distortion audio oscillator 52
Transistor switching for high power driving lights 56
A hexadecimal keyboard for microprocessors 60
Circuit and Design Ideas:
Trapezoid generator for musical synthesisers—Economical process gives professional panels—Brake light failure warning 61
Test message generator for data terminals 64
The Serviceman: Home units and TV aerials 74
Solid-state HF linear works up to 30MHz 76
A temperature compensated crystal oscillator 80
Electronics Australia data: Great circle map 85
Getting into Microprocessors: Assemble your own Mini Scamp programs 86
Getting into Microprocessors: Using Mini Scamp to generate random numbers ... 91
The Dick Smith-Electronics Australia Mini Scamp Contest 89
Record reviews—classical 94
Record reviews—devotional, popular, jazz 97
New Products 104
Letters to the Editor 107
Books and Literature 108
The Amateur Bands 110
Shortwave Scene 115
Information Centre 116
Marketplace—classified advertising 118
Index to Advertisers 120
Notes and Errata 116

Also inside:

- **A solid-state HF linear for 20-30MHz**
- **Transistor switching for high power headlights**

On the cover

Laser techniques in modern surgery is the theme of this month's front cover, and our main feature article commencing on page 12. This cover picture was taken during a recent operation at the Royal Princess Alexandra Hospital for Children in Camperdown, NSW, and shows laser apparatus in use to remove a growth from a patient's vocal cords. (Photo by staff photographer John Pinfold.)

What's a big company like Philips doing in a place like Hendon?

We are producing standard and custom designed Integrated Circuits: IC's that are Australian-designed, Australian-diffused, and Australian-made.

We could have imported from Philips' world-wide resources a complete range of IC's (we already bring in part of the Signetics range), but we believe that there is a need for a capability in Australia to support the national electronics industry.

So we have done something positive to back up that belief. We've trained and employed a highly skilled team of engineers, technicians, and process workers in our semi-conductor plant in Hendon, South Australia. We've put millions of dollars into the plant and equipment, and we'll invest more to satisfy the demands of the future.

Behind all this talk about ourselves, there's a host of benefits for you. A rapidly expanding range of efficient, top quality components designed and made to meet the growing needs of Australia's industry. A source of constant supply, free of the uncertainties and restrictions that are part and parcel of the importing business. An assurance that, when you choose an IC from the Philips Signetics range, you have the support of Australia's largest IC production plant and engineering expertise.

Think Integrated Circuits—
Think Philips.

PHILIPS ELECTRONIC
COMPONENTS AND MATERIALS
Sydney 427 0888;
Melbourne 699 0300;
Brisbane 277 3332;
Adelaide 223 4022; Perth 65 4199.

PHILIPS

Electronic
Components
and Materials

153.0199

Editorial Viewpoint

Further reflections on the energy crisis

Further to my recent comments about solar energy and the need for a national energy policy, I have just finished reading a most interesting and thought-provoking new book on the energy crisis. The book is "The Poverty of Power", written by Professor Barry Commoner and published by Jonathan Cape. I would recommend it to anyone seeking an insight into the complex socio-economic-political-technological factors behind the world's growing energy problems.

One of the points Professor Commoner makes is that when considered closely, taking both the first and second laws of thermodynamics into account, many of our existing ways of using energy are woefully inefficient. Quite often this is because of what amounts to a serious thermal impedance mismatch: using a concentrated high temperature or "high quality" energy source to perform distributed low temperature or "low quality" work.

Another interesting point made in The Poverty of Power is that the energy crisis is not due so much to the world running out of energy resources, but to the increasing costs of finding and using the resources. And this is because the resources we have been using and are still using are non-renewable, so that each barrel of oil, tonne of coal or kilogram of uranium we use tends to make it harder and more costly to find and use the next.

The irony of the situation is that during this century we have been methodically making ourselves more and more dependent upon these non-renewable energy resources, and less dependent upon the main source of renewable energy: the sun. For example, we have progressively phased out wool and jute (both are virtually derived from solar energy), in favour of petroleum-derived plastic textiles. And farmers have become more and more dependent upon phosphate and petroleum-derived fertilisers, using less solar-derived fertilisers such as manure and legumes.

One of the more thought-provoking contrasts Professor Commoner draws is between the complex, high technology and highly capital-intensive nuclear power industry and the intrinsically less complex, simpler technology required to use solar power—even at present. Compare, for example, a hydro-electric power station (which is really using solar energy) with a nuclear power station.

After reading Professor Commoner's book, it is hard to avoid the conclusion that we should be directing much more effort towards (a) improving the efficiency of our energy usage—i.e., conservation; and (b) shifting our usage away from non-renewable resources towards those that are renewable—in particular solar energy.

It seems to me that Australia could take a positive step in this direction almost immediately. For a variety of economic and political reasons, and perhaps to help solve the immediate energy situation, it now seems inevitable that we are going to mine and sell our uranium. This short-term expedient could be used to support our long-term energy investment, by using some of the resulting income to finance energy conservation and solar energy technology development programs.

—Jamieson Rowe

ON SALE THE FIRST MONDAY OF EACH MONTH

Registered for posting as a periodical—Category B.
Printed by Dalley-Middleton-Moore Pty Ltd, of Wattle St, Sydney and Masterprint Pty Ltd of Dubbo, NSW, for Sungravure Pty Ltd, of Regent St, Sydney.
*Recommended and maximum price only.

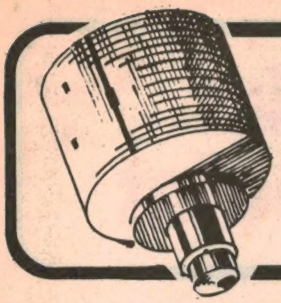
Editorial Office
57-59 Regent St, Sydney 2008
Phone 699 3622.
Postal Address: PO Box 163, Beaconsfield 2014.

Advertising Offices
Sydney—57-59 Regent St, Sydney 2008. Phone: 699 3622.
Representative: Narcisco Pimentel.
Melbourne—392 Little Collins St, Melbourne 3000. Phone: 67 8131.
Representative: Keith Watts
Adelaide—Charles F. Brown & Associates Ltd. 168 Melbourne St., North Adelaide 5006.
Representative: Tom Duffy 267 4377.
Perth—454 Murray Street, Perth 6000.
Representative: Jack Hansen 21 8217.

Subscriptions
Subscription Dept, John Fairfax & Sons Ltd, GPO Box 506, Sydney 2001. Enquiries: Phone (02) 498-3161.

Circulation Office
21 Morley Ave, Rosebery, Sydney 2018. Phone 663 3911.

Distribution
Distributed in NSW by Sungravure Pty Ltd. 57-59 Regent St, Sydney, in Victoria by Sungravure Pty Ltd, 392 Little Collins Street, Melbourne; in South Australia by Sungravure Pty Ltd, 101-105 Weymouth St, Adelaide; in Western Australia by Sungravure Pty Ltd, 454 Murray Street, Perth; in Queensland by Gordon and Gotch (A'asia) Ltd; in Tasmania by Ingle Distributors, 93 Macquarie St, Hobart; in New Zealand by Gordon and Gotch (NZ) Ltd, Adelaide Rd, Wellington.



News Highlights

The computer you can talk to!

"Whadya wanna drink?", said Robert Harkness into the microphone attached to the headset he was wearing. The answer flashed onto a small Self-Scan panel display—"A glass of beer".

Harkness, a sales engineer with EMI (Australia) Limited, was speaking to Threshold Technology's Voice Data Entry System (VDES), a voice recognition system that enables data to be entered verbally into a computer. This eliminates the need for manual transcription or keying operations of data and results in improved accuracy of data input and time and cost savings.

The demonstration given by Robert Harkness was simply to illustrate that as well as being able to recognise specific words (or data inputs), the Threshold 500 can also be trained to give a predetermined response to a word or phrase. EMI are now importing the Threshold 500 system from Threshold Technology, Delran, New Jersey, and is offering the unit for sale in Australia. Cost of the basic unit is close to the $13,000 mark.

Specifically, the Threshold 500 system is intended to provide industry with an economical, error-free method of collecting inspection, production and other data in either an on-line or off-line mode of operation. The system is particularly valuable for data entry by personnel whose hands are already occupied in their normal work environments and, when used in conjunction with a radio transmitting headset, allows personnel to maintain their mobility.

Because data is entered by voice, continuity of the job can be maintained, and interruptions caused by keying eliminated. The output of the Threshold 500 terminal is in the same format and code as that of a standard keyboard terminal.

Heart of the system is Threshold Technology's VIP-100 Word Recognition System which accepts the spoken commands via a small microphone worn by the operator. An incoming voice entry is analysed and compared to a set of reference samples previously provided for each vocabulary word by the operator during his initial training period. Training data for multiple operators can also be stored in the system, enabling the VIP-100 to recognise spoken words from a wide range of speakers, regardless of vocabularies, dialects and noisy backgrounds.

To use the system, the operator must train the terminal to his particular voice and local accent by repeating each command and data word a number of times. The recognition processor program then defines pronunciation parameters for each word, and stores them in the terminal. Any language can be used with the system.

System vocabulary can be in excess of 220 utterances, although most practical applications in industry will require only 20-50 utterances. The basic system has a vocabulary of some 32 utterances. Recognition accuracy is claimed to be 98-99%. An editing capability allows any misread words to be corrected.

A typical application of the VDES is in the television picture tube plant of Owens-Illinois at Pittston, Pennsylvania. Here the system is used for hands-free entry of quality control data.

In the Owens-Illinois system, a quality control inspector enters, by voice, the physical measurements of the television faceplate he is inspecting, leaving both hands free to position the item for measurement.

The quality control inspector begins the day by entering such information as the item type, date, shift, time, name of inspector, and any other pertinent information. This information is printed out as the heading on the report generated at the conclusion of a series of measurements.

The inspector now enters measurement data into the VDES. As measurements are entered the inspector verifies them on the display and speaks the control word "go", which inputs the data to a computer for computation and printout.

Any incorrect data can be erased simply by saying "erase". At each step in the process the system displays the measurement to be made, the sample number of the item being measured, and the standard value of the measurement. The operator is alerted to any out-of-tolerance measurements.

Other applications of the Threshold 500 VDES include automated material handling, parts programming for numerically controlled machine tools, and direct voice input to computers.

—Greg. Swain.

BPO commits Viewdata to public trials

More than one thousand people will be invited to participate in a £4m Post Office trial of Viewdata—the revolutionary communications system linking telephone and television—Sir Edward Fennessy, Deputy Chairman of the British Post Office and Managing Director Telecommunications, announced recently.

With Viewdata, users can—at the touch of a button—call up information over the phone and display it in words or simple diagrammatic form on a television screen.

The Viewdata market trial, involving people at home and at work in London, Birmingham and Norwich will start in mid-1978. Users taking part will have access to 60,000 "pages" of information. If the trial is successful, it could develop into an initial public Viewdata service by 1980, and be extended throughout the UK during the 1980s.

Viewdata uses an ordinary telephone linked to a modified domestic television set. The Viewdata information enters the TV set over the phone line. Extra electronic circuitry in the set causes the information to appear in up to seven colours on the screen. A separate handheld push button unit—like a pocket calculator in size and appearance—is connected to the TV set, to enable users to select the information.

The telephone can still be used for making and receiving phone calls at other times.

The major attraction of Viewdata is the almost limitless store of information that customers could call up on the screen. This wealth of information will range from up-to-the-minute news to household hints, and from stock market prices to sports results. It will include information on such subjects as leisure activities, jobs, careers, motoring, travel, holidays, education, money, welfare services, business services, and commodity prices, as well as a wide range of facts and figures.

In addition, Viewdata can store simple messages for users—for example, to phone someone at a given number, or to indicate an expected time of arrival. The Post Office is now looking at possible ways of enlarging this facility.

It plans to develop a pushbutton unit with all the letters of the alphabet as well as numbers, to enable users to 'type' in their own messages. This will, for the first time, open up an easy way for deaf people to communicate with others over the phone.

The purpose of the market trial is to test public reaction to Viewdata and its charges. It would also compare reactions to Viewdata and to Teletext—the broadcast information services provided by the BBC and IBA. And it will help information providers and the TV industry to test and evaluate the market—both domestic and commercial—for information and for television receivers adapted to receive Viewdata.

Telephone Jubilee

1977 is the Golden Jubilee Year of the trans-Atlantic telephone service between Britain and the US. Picture shows the giant 90ft dish of aerial No. 3 at Goonhilly Downs, Cornwall, the first European earth station to receive and transmit telephone calls by satellite.

High density video disc system

Hitachi Ltd. has developed a prototype of an optical video disc system that can record 50 to 100 thousand signatures on one video disc 30cm in diameter. The recording and reproduction is by laser.

This system, with its large capacity for storage and quick retrieval of image information, is suited to such areas as banking for depositors' signatures, police for fingerprints, hospitals for X-ray pictures, etc. In addition the system is expected to find a wide field of application in still picture broadcasting and in visual communications.

The system was developed by the Hitachi Central Research Laboratory. Picture information sent through the TV camera or VTR is recorded by means of a laser beam 0.6 micrometer in diameter on a video disc 30cm in diameter turning at 30 revolutions per second.

For reproduction, a laser beam 1.0 micrometer in diameter is directed at the track of the video disc and the resulting reflections read and converted into a picture. Reproduction of a desired picture is a fast 0.5 to 3 seconds by means of keyboard push-button operation.

Towards the X-ray laser . . .

A major step toward X-ray lasers has been claimed by a six-man US Naval Research Laboratory team with the generation of coherent laser radiation at 38 nanometers (7.8×10^{15}Hz) at pressures up to 120 torr. Such lasers are sought for testing new materials and to provide a new technique for producing "superminiaturised" microcircuitry.

The 38nm wavelength was achieved by seventh harmonic conversion of mode-locked laser pulses at 266.1nm, converted from the fourth harmonic of a neodymium-YAG laser. Spot size was reported as 5um through a calcium-fluoride lens 5cm long.

NEWS HIGHLIGHTS

Australian Research:

New silicon cells promise cost savings

by Dr Martin Green, School of Electrical Engineering, University of New South Wales

Sunlight can be converted directly into electricity using silicon solar cells. They offer an environmentally acceptable way of generating a significant proportion of the Earth's future energy demands but, at present their major drawback is high cost. A research effort involving Professor Lou Davies, Mr Bruce Godfrey and myself is directed towards a new type of silicon solar cell which should be much cheaper to produce than conventional cells.

In our search for a less expensive type of silicon solar cell we have made one which does not need a "P–N" junction, thus eliminating the sophisticated and expensive operations required to introduce the two impurities. Nor do we need silicon of the same high quality for our starting material.

The new solar cells—called Metal-Insulator-Semiconductor (MIS) solar cells—have a five-layer structure. The centre layer is silicon, a semiconductor. The layers on either side of this are extremely thin, but very important, layers of silicon oxide, an insulator. The top and bottom layers are different metals, the top one being quite thin so that sunlight can pass through it to the silicon.

The metals on the top and bottom not only act as electrical contacts to the cell but also cause the electrons created by the sunlight in the silicon to move in the same direction as a result of their different electronic properties. The MIS cell can be made electronically equivalent to the conventional "P–N junction" solar cell.

Dr. Martin Green (seated) and Mr Bruce Godfrey, with one of the MIS solar cells.

We expect by the end of the year to be able to produce MIS solar cells which are as efficient at converting sunlight to electricity as commercial cells (about 12% efficiency). Our research will then be directed towards seeing just how low in quality and therefore cost, our silicon can be without causing a significant reduction in efficiency.

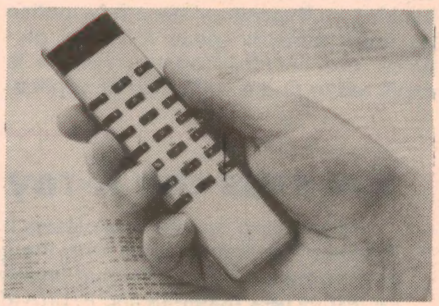
This year the work is being supported with the help of a $15,167 grant from the Australian Research Grants Committee and a smaller grant from the Radio Research Board. Due to the encouraging results obtained over the last year, increased amounts are being sought from grant-saving bodies to permit the group's work to continue and expand beyond the end of 1977.

Reprinted from UNIKEN, the campus newspaper of the University of NSW.

Award-winning pocket calculator

This slim-line Sovereign 'one-handed' pocket calculator was one of eight British products in the consumer and contract goods section to receive a 1977 Design Council Award this year. It has a five-function memory, an automatic constant and percentage key, with hard-wearing steel case finished in brushed satin chrome.

Since the Sovereign was first launched in October last year, more than 40,000 have been sold—70 per cent going to overseas markets. One Middle Eastern customer bought six in solid gold at £2,750 each.



Reader enquiries to Sinclair Radionics Ltd, London Road, St Ives, Huntington, England.

World energy demand will double by 1990

World consumption of energy is projected to increase 4.6 percent annually (compared to 5 percent between 1960 and the peak year of 1973) and reach 520 quad-rillion BTU's by 1990. A substantial shift toward nonhydrocarbon sources of energy such as nuclear, solar, geothermal and hydropower is expected.

These are some of the conclusions of "World Energy Supply and Demand," a new study prepared by the Economic Research Group of Predicasts, Inc., a Cleveland based market information and research firm.

The energy picture in the 1980's will continue to be affected by political factors in both producing and consuming nations, and a detailed examination of the situation leads to the conclusion that the late 1980s will be a period of renewed tension between the two groups, according to Predicasts.

Historically, electric power generation and motor vehicle use have been the fastest growing sectors of consumption. However, industrial uses accounted for nearly 50 percent of consumption in 1973, a share which dropped slightly during the following two recession years. Conservation measures in North America, Western Europe and Japan will tend to slow increases in motor vehicle and household usage through 1990, and promote more efficient utilization of industrial energy.

Business Briefs:

NEW MARKETING MANAGER FOR TOSHIBA-EMI

Mr Hiroshi Tsutsui, formerly marketing manager, Toshiba-EMI (Australia) Pty Limited, has been appointed marketing director. Mr Tsutsui joined the company in November, 1975, when Tokyo Shibaura Electric Co. Ltd and EMI (Australia) Ltd established Toshiba-EMI as a joint venture company to market and service television, radio, hi-fi and other domestic electrical products in Australia.

AWA INTEGRATES SEMICONDUCTOR OPERATIONS

Amalgamated Wireless (Australasia) Limited has integrated the RCA semiconductor Agency and their own custom-integrated circuit facility into one operation at the company's plant at Rydalmere, Sydney. AWA Microelectronics Manager, Dr G. A. Rigby, said that the integration would benefit both operations and provide a uniform approach to semiconductor product sales.

Electronics is where it's all happening

...if you're into it you've got it made!

It's the world's fastest growing industry... with new discoveries...new products every day. And, every day, there are more jobs...bigger salaries...better opportunities...for people who are trained.

You can be part of this boom **now** by training with International Correspondence Schools. Learn to design, build, install, test, control and maintain modern electronic equipment...from your own colour TV or hi-fi set to a digital computer.

Your career opportunities are limitless...in broadcasting, industry, the military, aerospace programs, medical science and communications. With your enthusiasm and ICS tuition, a well paid job and a secure future in electronics is well within your grasp.

How do I get into it? ICS have put together a FREE Electronics Career Folder. It tells you all about the many courses open to you including Communications and Broadcasting, Industrial Electronics, Computer Servicing and Audio/Radio Servicing...courses endorsed by the Television and Electronics Technicians Institute of Australia. Post the coupon and the career folder will be on its way to you without obligation. Don't wait another minute...progress won't. The big developments in electronics are happening now and the demand for skilled people is growing all the time.

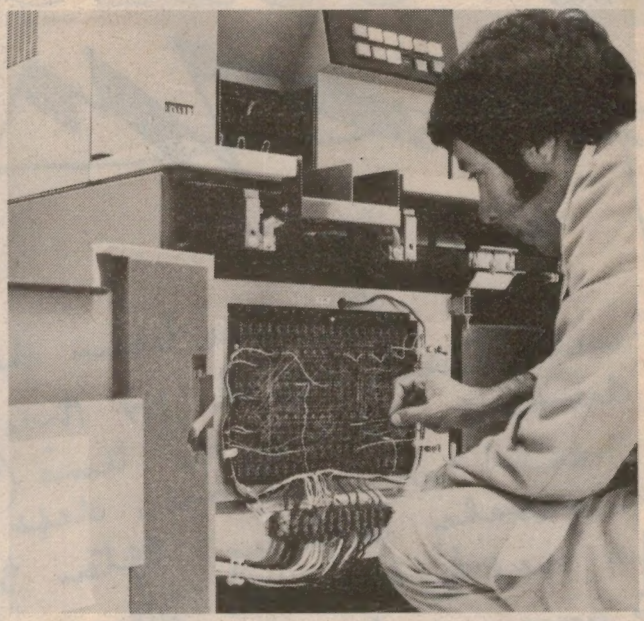
Special Colour TV repair course.
Colour TV is booming all over Australia, beyond the expectations of all the manufacturers, resulting in a shortage of qualified people to fill the service gap.

You could make a successful career in this growing field with the help of the ICS School of TV Servicing. You can benefit by this course – all you need is the enthusiasm to learn and enjoy rewarding work.

Your ICS course could be a start of an exciting new career or you can use your new-found knowledge to earn extra money in your spare time.

This special course is endorsed by the Television and Electronics Technicians Institute of Australia.

Send the coupon today. It could be the first step in an exciting new future for you.



Find out how you can be where it's all happening – in Electronics. Fill in the coupon and post today!

ICS Home Study ...your passport to success in life!

Your invitation to join the thousands of successful ICS graduates.

To: International Correspondence Schools
400 Pacific Highway, Crows Nest. NSW. 2065
18-20 Collins Street, Melbourne VIC. 3000
182 Wakefield Street, Wellington. N.Z.

YES!

Please send me, entirely without obligation, a copy of the:
☐ ICS Electronics Career Guidance Kit
☐ ICS Colour TV Servicing Career Guidance Kit.

MR/MRS/MISS _____

ADDRESS _____

_____ POST CODE _____

PRESENT OCCUPATION _____ AGE _____

**Take the first step –
Fill in and mail this coupon today!** **ICS**

PKB54430

SPECIAL DEAL FOR MAIL ORDER CUSTOMERS

Dear Sir.

I have been dealing with Dick Smith for three years, during most of the time (I will be frank) his mail order dept has been severely lacking. Often 3 to 4 weeks for readily available items. The reason I am investing 20c is to congratulate you on your new mail order dept. I find it more than satisfactory & compared with 6 months ago incredible. only good can come of this both for Dick & his customers.

Congratulations. Ron Lockerbie

Dick Smith has always valued the support of his customers who prefer to buy electronics through the mail . . .

The copy of an unsolicited letter published here reflects a major re-structuring of his mail-order department to offer a "Prompt and reliable service" *(a very special deal)*

Buy through the mail for convenience — and at the same time save money!

75¢

MAIL ORDER CATALOG
86 COLOR PAGES

IF YOU DON'T HAVE A COPY OF THIS FANTASTIC CATALOG THEN SEND FOR YOUR COPY TODAY. (Enclose 75c to cover postage)

DSE65EA87

DICK SMITH ELECTRONICS

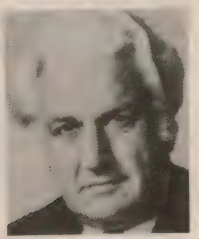
Write to P.O. BOX 747 Crows Nest. 2065 NSW. Ph. 439-5311

NEWS HIGHLIGHTS

New VCR has built-in tuner

Designed for the home viewer, the new Philips N1502 Video Cassette Recorder features its own built-in tuner so that you can record one program while watching another. Other features of the unit include a three day electronic timer (which enables the machine to record a specific program while unattended), and a "freeze action" facility. The unit can also record directly off a black and white or colour video camera.

G-G to open IREE convention



Sir John Kerr

The Governor-General, Sir John Kerr, will officially open the Australian Institution of Radio and Electronics Engineers (IREE) international convention, IRRECON, in Melbourne on Monday, August 8, at 2 pm.

The convention has been organised by the IREE and, together with the associated electronics equipment exhibition, will be staged in the Exhibition Buildings in Melbourne from August 8-12.

Australian and overseas scientists and engineers will take part in a five day program of lectures and demonstrations. About 80 local and overseas manufacturers and agencies will display some of the latest developments in electronics.

Readers wishing to attend the exhibition, but without tickets, should apply to any of the companies who are exhibiting.

The Dick Smith of Orange

Latest in the growing dealership network of Dick Smith Electronics is M & W Electronics of 48 McNamara St, Orange.

M & W stock the full range of components and kits from Dick Smith Electronics, along with a very comprehensive range of Midland and Sanyo CB radios and accessories. Service facilities are also available.

Proprietors of the store are Merv Brady and Bill Jamieson, who report that business for the first few months of operation has been very good.

Liquid crystal TV screen

An experimental black-and-white TV screen made of liquid crystal elements has been developed in Japan by Hitachi Ltd. Engineers who built the 6-inch diagonal screen say the goal is to market in two or three years a pocket-size TV roughly the size of a hand-held calculator.

The new design still requires a number of improvements, as Hitachi readily concedes. For example, the contrast ratio of between 10:1 and 20:1 needs to be increased, although it has an adequate number of 16 contrast steps. The liquid crystal response time of 200ms also needs improvement in order to keep up with fast moving scenes.

The screen itself is comprised of a thin layer of twisted nematic liquid crystal sandwiched between two 3mm thick glass plates with transparent electrodes. It has 8,938 elements, 82 vertically by 109 horizontally. Case dimensions are a compact 245 x 195 x 40mm (W x H x D), while the display area measures just 120 x 90mm.

Polarising filters are on both sides of the panel. A light source is situated behind the rear filter to ensure that the display can be viewed even with low ambient illumination. This light could be replaced by a mirror in well-lighted rooms or outdoors.

CMOS ICs drive the display, which is claimed to consume only about 10mW. The remainder of the TV circuitry draws about 5W, although this could be reduced according to Hitachi.

Defence contract to AWA

Amalgamated Wireless Australasia Limited will play a vital role in a $7 million electronic equipment contract recently announced by the Royal Australian Navy.

AWA has entered into an agreement on the contract with a major Italian electronics company, Elettronica S.p.A., Rome. Elettronica S.p.A. was awarded the $7 million order for six electronic support measures systems for installation in RAN destroyer escorts.

The systems comprise passive receiving equipments used to intercept, locate and analyse radar emissions in support of military operations. They are being purchased to replace existing outdated systems now in use on the destroyer escorts.

AWA will be responsible for preparation of the overall system documentation and the long-term maintenance of the equipment. The Australian Government intends to establish a maintenance facility within the AWA works at North Ryde, Sydney.

OPERATION

Sixty years ago, the postmaster at Hall's Creek in Western Australia performed an emergency operation on an injured man, to instruction by Morse code from a doctor in Perth 3000km away. This intriguing article retells the dramatic story of that operation, and describes the desolation and decay that is Hall's Creek today.

Travel the Great Northern Highway 2930 kilometres north from Perth or 375 kilometres south from Wyndham. Or venture the tough and rugged journey through the Tanami Desert from Alice Springs over 1000 kilometres away . . . by any of these routes you will come to Hall's Creek (population 700), a neat prosperous-looking town with a sense of civic pride and appreciation of its historical heritage. This is New Hall's Creek.

Yet by none of these routes, nor in the town itself, would you see much of the historical heritage, now dating back almost 100 years. That is at Old Hall's Creek, a ghost town—indeed just a cemetery and a collection of derelict roofless buildings—14 kilometres south-east of the new town.

Certainly, if you travelled by the Tanami Track, you would pass Ruby Plains cattle station 75 kilometres south of Hall's Creek. The interest of Ruby Plains is that it is the starting-point for one of the most extraordinary and most dramatic of all the Hall's Creek stories.

And it is a Telecom story—the story often referred to locally as Operation Telegraph. Its main characters are James Darcy of Ruby Plains, and Hall's Creek postmaster Frank Tuckett. The year was 1917.

Frank Tuckett was one of that hardy breed of outback postmasters who meant much more to their small communities than routine mail and telegraph service. And in Frank's case the selflessness of his service was supplemented by an expertise in first aid.

This skill was freely available to the local population, mainly a mining community searching for gold, which had first been discovered in the area in 1883. Cattle stations had also been established in the vicinity.

Although Hall's Creek had a post office, a hotel and several stores, it had no doctor or hospital. The nearest doctor was at Derby, 575 kilometres away. For minor ailments or injuries, therefore, it was customary to call on the good services of postmaster Tuckett.

Frank could cope with most of this. He had been trained at a St. John Ambulance school in Perth. But there came a night when he was faced with something beyond his capabilities.

Earlier in the day, during cattle mustering at Ruby Plains, a serious accident had occurred. The victim was James Darcy, 29, who had been thrown from his horse. He sustained severe internal injuries.

If such an accident happened today, there would be an immediate urgent medical call to the Royal Flying Doctor Service (RFDS) base at Wyndham. Urgent medicals have priority over all other traffic on the RFDS radio network.

But in 1917 there was no RFDS. And there was no doctor at all anywhere near Ruby Plains. There was only Frank Tuckett 75 kilometres away.

The journey to Hall's Creek was made by horse and buggy. It was an agonising journey, with frequent stops necessary to allow the injured man some temporary relief from pain.

The accident had occurred in the morning. Such was the torture of the journey that it was late evening when they reached Hall's Creek. Frank Tuckett, all traffic cleared, was settling down for the night.

Suddenly there was an urgent knock on his door, and a human life was placed in his hands. He gave the injured man an injection of morphia to ease the pain and then went to his Morse key to try to call a doctor.

First he tried Derby. The doctor, he was told, was out of town and was not expected back for some time. He turned to Wyndham. No doctor was there. None could be expected at least until the next boat arrived from the south.

Meanwhile Darcy was getting worse. Frank Tuckett had only one card left to play.

He settled again over his morse key and called Perth CTO nearly 3000 kilometres away. Could the office, with the utmost urgency, call in a certain doctor for consultation. This was the doctor who had been Frank's instructor in a St. John course some years ago.

This was done. The doctor on the line, Frank gave a careful, detailed description of the injured man's condition. The diagnosis was immediate.

"The patient has a rupture of the

All that remains of the scene today of Frank Tuckett's heroic effort to save the life of a fellow man . . . the Post Office and Telegraph repeater buildings at old Hall's Creek.

TELEGRAPH

by MARY ELLIOTT

urethra. An immediate operation is essential."

But how? And by whom?

"Impossible," said Frank Tuckett. "There are no instruments here and no anaesthetics, quite apart from no doctor.

Back came the morse from Perth.

"You have morphia, permanganate of potash, a pocket knife and a razor. you must do it."

"I might kill the man."

"If you don't hurry, he will die."

So Operation Telegraph got under way. Step by step the doctor detailed instructions to the morse operator in Perth. Far away in lonely Hall's Creek, Frank Tuckett read the morse and carefully did as he was told.

After it was over and Darcy had been made as comfortable as possible for the night Tuckett conferred again with the doctor and the two arranged to consult again concerning the patient's condition.

When they did, Tuckett had to report that there were complications caused, he thought, by the severe jolting the patient had received from the journey from Ruby Plains.

So the doctor ordered a second operation. Still a third was needed before the doctor pronounced that Operation Telegraph had been successful.

The whole episode made headlines in the newspapers of the day. On 11 August the West Australian reported that Darcy was progressing favourably.

Nevertheless the doctor decided to go north and examine the patient himself. He travelled from Perth to Derby by ship and then set out on the 575-kilometre journey inland in a small motor car.

He was almost there—at Moolabulla Station only 30 kilometres from Hall's Creek—when the car broke down. He completed the journey in a horse-drawn vehicle.

It was 13 days since he had left Perth. He felt reasonably confident about the probable condition of the patient. But it was a sad-faced Frank Tuckett who met him at the post office. "It's too late, Doc," he said. "We buried poor Jim Darcy today."

Darcy, he went on to explain, had developed pneumonia. And for that there was nothing that Tuckett could do. "If only you had arrived yesterday you might have been able to save him, but we couldn';t make him hold out any longer."

Graham Dunn, Postmaster at New Hall's Creek, is Frank Tuckett's modern day successor.

Frank Tuckett was bitterly disappointed. Darcy's death from pneumonia was a tragic anticlimax to the tense drama of the past two weeks.

The small mining community was worried. As long as Hall's Creek was without adequate medical facilities, there was high risk that the tragedy would be repeated.

They appealed for help from the Australian Inland Mission. The AIM responded by setting up a small hospital in a disused Miners' Institute building.

By the early 1950s, a new township, called New Hall's Creek, was being built. Public services gradually moved into the new town and, when a hospital there was completed in 1953, the hospital at Old Hall's Creek was closed.

In 1959, when the police station moved to New Hall's Creek, the old town was completely abandoned and left to fall into ruin.

But go to Old Hall's Creek today, take a short stroll among the ruins and you will find relics of Operation Telegraph.

One is the old post office, the best preserved of all the old buildings, where the operation took place.

The other is a headstone set in a rectangle of scorched grass boarded with tall iron railings. The name on the headstone is James Darcy.

Mary Elliott is a former journalist with Telecom Australia. This article first appeared in "Telecom", House Journal of Telecom Australia, and is reprinted by permission.

James Darcy's lonely grave at Hall's Creek. The inscription reads: "Sacred to the memory of James Darcy who died at Hall's Creek, 22nd August 1917 aged 29 years. RIP."

Cover Story:

The Laser—its place in Modern Surgery

One of the dramatic stories of the last decade has been the development of the laser from a scientific curiosity into a versatile medical tool; one which offers a whole new approach to many serious surgical problems. This article looks at the various roles in which it has been tried, the hardware that has been developed, and the successes it has achieved.

by PHILIP WATSON

When the laser was first developed, around 1960, and for some time afterwards, it was cynically described as "an invention looking for an application". While true at the time, it has long since justified its existence in science, industry, and – most of all – the medical field. This latter role, in particular, is the one which has caught the public's imagination.

But what is the practical situation? What kind of hardware is available to the medical profession, and what kind of work is being done with it? More importantly, does its use constitute a real advance in medical technology?

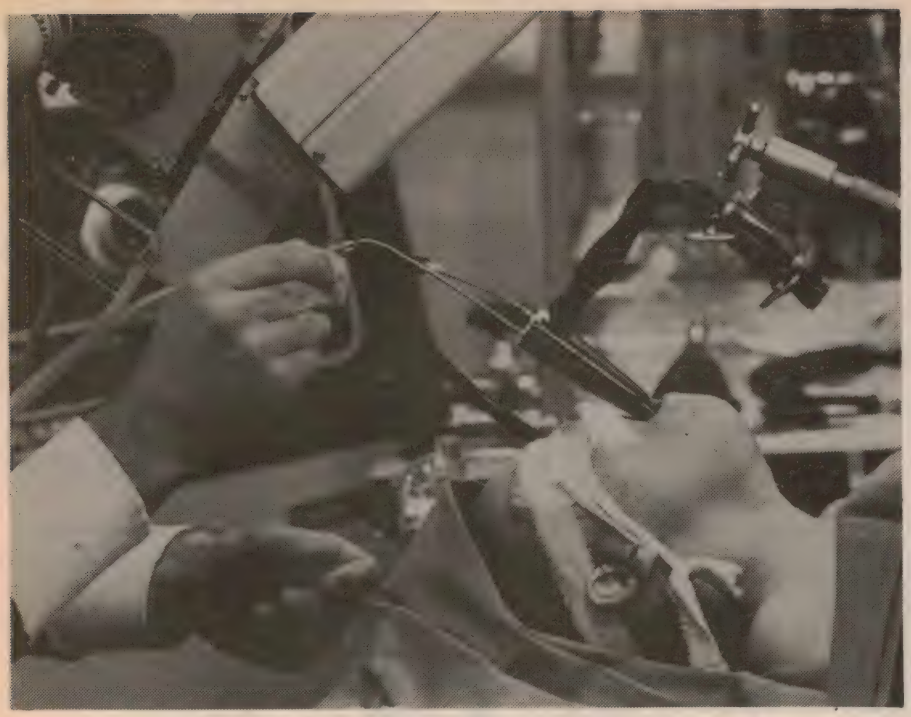
The opportunity to find the answer to some of these questions came recently when we were able to examine one of the latest surgical laser units to be imported into Australia, and to learn something of the work being done with these units, both here and overseas.

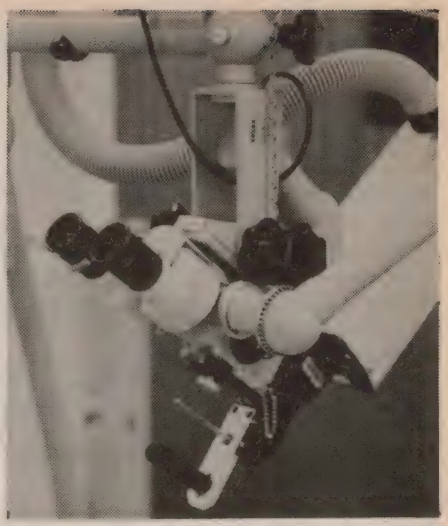
One of the earliest laser applications was to "weld" detached retinas, using low power ruby lasers emitting visible light. A major feature of the laser in this application is the small size of the spot, which is well suited to the precision required for this job.

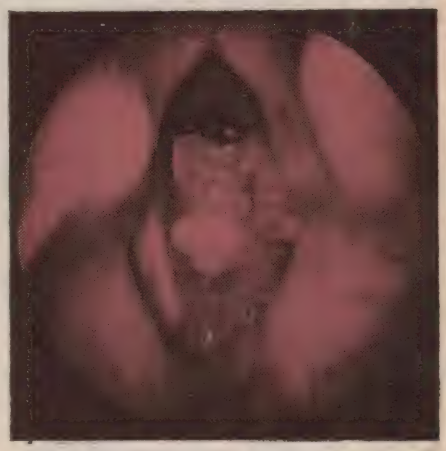
The visible light passes readily through the eye's lens and the vitreous material behind it, which are sufficiently transparent as not to dissipate any significant amount of energy. The retina itself, on the other hand, has a high energy absorption, thus confining the effect of the laser to this part of the eye. Subsequently, the argon ion laser was developed for ophthalmic surgery, and this technique is now well established.

Later came the concept of using the laser as an actual cutting tool in place of the scalpel. Early experiments were not very encouraging, the lasers then in use being apparently unable to make a significant impression on tissue, in the cutting sense.

Subsequently it was established that







Opposite page: General scene in the operating theatre with the laser being used for a throat operation. The doctor is manipulating the "joystick" with his left hand and a suction tube with his right. Above: Closeup showing the laryngoscope inserted in the patient's throat. The patient's eyes are covered to avoid any risk from the infra-red beam. Top right: The operating microscope with laser head attached. The bright metal rod below the microscope is the "joystick" control. Right: A child's throat showing a typical papilloma already blocking part of the windpipe. (Note that this is not the patient in the other pictures.) The theatre pictures were taken at the Royal Princess Alexandra Hospital for Children, Camperdown, N.S.W.

the wavelengths being used, 1.06 microns for the neodymium laser and 0.69 microns for the ruby laser, were unsuitable for adequate energy absorption by tissue.

This situation changed dramatically with the development of the CO_2 (carbon dioxide) gas laser. The CO_2 laser generates infra-red energy at a wavelength of 10.6 microns. At this wavelength, there is a very high absorption of energy by the water content of biological cells. The energy is converted to steam, and literally blows the cell apart. This method of separating tissue has shown itself to have a number of significant advantages over conventional methods.

When a surgeon makes an incision, a number of serious problems are immediately created. First, he has to cope with bleeding. While small quantities of blood can be swabbed away, larger blood vessels must be clamped and tied. Even with the best effort possible the patient can lose a significant amount of blood; enough to slow down the recovery rate.

Another serious problem is infection. Any open wound is ripe for attack by bacteria and it is only by a ritual of the most scrupulous cleanliness, observed by all associated with the patient, that modern surgery has reached its modern high standard of safety. Even so, some surgical procedures recently developed require a "clean room" environment, as well as all normal precautions, to ensure adequate protection.

Finally, the wound has to heal. Healing should be as rapid as possible, as free from pain as possible, and leave minimum scarring. The faster the wound heals, the less chance there is of infection and the sooner the patient can resume normal activities, while the need to minimise pain is obvious. Scarring may be objectionable for purely cosmetic reasons, or it may actually impair the function of the organ concerned.

One of the most valuable features of the surgical laser is its ability to seal blood vessels as it cuts. This effect is virtually complete for blood vessels up to about 0.5mm in diameter. Slightly larger vessels can often be coagulated with the laser beam, while being held closed under pressure.

Another valuable feature is rapid healing. This appears to be due to the fact that there is minimum damage to the cells adjacent to those actually destroyed. Typical figures suggest that higher powers (up to 100W) produce adjacent damage for a distance of some 500 microns (.005mm) only. For lower powers (up to 20W) the damage extends for a thickness of only a few cells.

Also, and probably for the same reasons, there is marked reduction in both post-operative pain, and in scarring. And consistent with the latter, there is less contracture, or the tendency of muscles to be shortened by scar tissue.

(Earlier attempts to provide bloodless surgery, using diathermy, were less successful than had been hoped. A major problem was that a considerable depth of cells on each side of the cut was destroyed, This delayed healing, caused much wider scarring and, worst of all, could lead to internal bleeding after several days, due to the breakdown of the damaged cells.)

Another advantage is that the laser cuts without any object being brought into contact with the tissue. This simplifies surgery in confined spaces, where it may be difficult for the surgeon to reach the area with a scalpel and still have a clear view of what he is doing. Typical examples involve surgery in the nasal cavity, mouth, and upper digestive tract.

The laser also permits more precise surgery. Particularly in confined spaces, the accuracy of a cut made with a scalpel depends on the steadiness of the surgeon's hand. Using the laser, the surgeon can select the precise spot at which he wishes to separate the tissue, using a guide beam, and activate the laser only when he is satisfied that positioning is correct.

But the CO_2 laser is more than just an improved scalpel. It has emerged as a tool for the direct destruction of unwanted cells, with a minimum of damage to surrounding healthy tissue and a minimum of complications. To many doctors and surgeons this may well

The Laser in Modern Surgery

develop as its major role.

So much for the concept of laser surgery. What kind of hardware is currently available to put these ideas into practice?

The equipment which inspired this article was a surgical laser unit made by Coherent Radiation, of California, USA, and distributed in Australia by S & L Electronics Pty Ltd, 546 Malvern Rd, Hawksburn, Victoria. The demonstrations we witnessed were arranged by OPSM Instruments Pty Ltd, 66 Reservoir St, Sydney, in co-operation with S & L Electronics.

This particular piece of equipment is known as the System 400 CO_2 surgical laser and consists of two main units: the laser tube proper with its associated optical system, and a control cabinet containing power supply, cooling system, gas bottle, timing and power controls. The two units are connected by an umbilical cord designed to provide maximum freedom of movement for the laser head.

This form of construction is a variation on some early designs, in that the tube has been separated from the cabinet. The earlier models mounted the tube in the cabinet and directed the beam to the working position via a multi-jointed tube and a complex system of mirrors. Some systems also need access to a water supply and drainage system to cool the tube.

Water cooling is still used in the System 400, but it is a closed system. Water is pumped from the cabinet, through hoses in the umbilical cord to the tube, then back to the cabinet and through a radiator which is cooled by a fan. Thus the system needs only a standard power point for its operation.

The laser head contains two lasers. Along with the main CO_2 high power, infra-red cutting laser there is a low power helium neon visible red laser for sighting.

The cutting laser uses a flowing gas system, i.e., the gas used in the laser tube is expelled from the system after passing through the tube. This system, while more complex, has advantages over either a sealed gas system or a recirculating gas system. Both tend to produce unwanted gas compounds, with use, and the closed system can handle only about one third the power. The gas is a mixture of helium, carbon dioxide, and nitrogen. The sighting laser is a sealed gas type.

The laser head is designed to be attached to a standard binocular operating microscope and stand, of the type normally used for intricate operations. The head is fitted with a counterbalance mechanism to allow easy adjustment to the most convenient angle.

Both laser beams follow the same path, Emerging from the head they are turned at right angles and run parallel with the microscope's line of sight.

A typical operating microscope would be fitted with 400mm (16in) objective lenses, which means that they are used approximately at this distance from the working site. They are also fitted with an optical split which allows a camera—film or TV—to view the area without obstructing the doctor.

Just below the microscope is a small "joystick" type control coupled to the optical elements at the end of the laser head. With it the sighting beam can be moved anywhere within the working area. The sighting beam produces a small red spot of about 2mm in diameter and, aided by the enlarged image through the microscope, it is possible to position this with high precision and hold it rock steady.

The duration and power of the cutting pulse are selected by controls on the cabinet. A five position switch provides 0.1s, 0.2s, 0.5s and 1.0s pulses, or continuous operation.

Power can be varied continuously from zero to the maximum of 25W. The power control is actually a variable auto transformer, but is also mechanically coupled to the gas supply line so that the rate of gas flow is varied according to the power requirements.

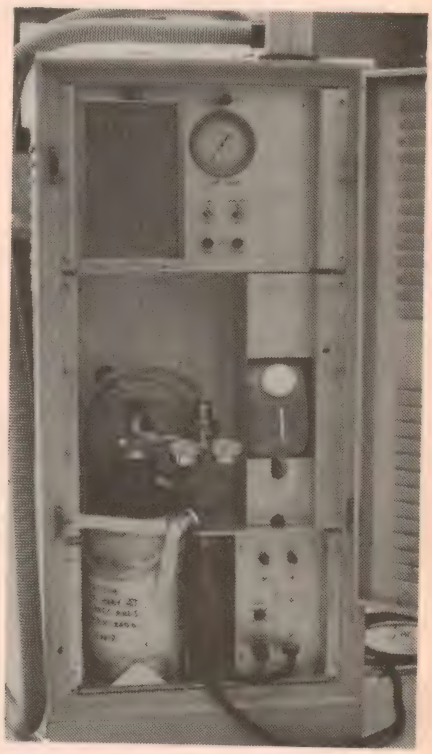
The timing system has an interesting built-in safety device. Timing of the laser pulse is by means of a solenoid operated shutter in the laser head. This is controlled, in turn, by timing circuits in the cabinet. (The laser runs continuously, once a "Ready" button on the panel is activated.)

The light released by the shutter is monitored by a photocell connected to a separate timing circuit. This timing circuit is also selected by the pulse duration switch on the front panel and the system is so arranged that, if the photocell circuit senses that the cutting beam is present for 20% longer than the selected time, the whole system is shut down.

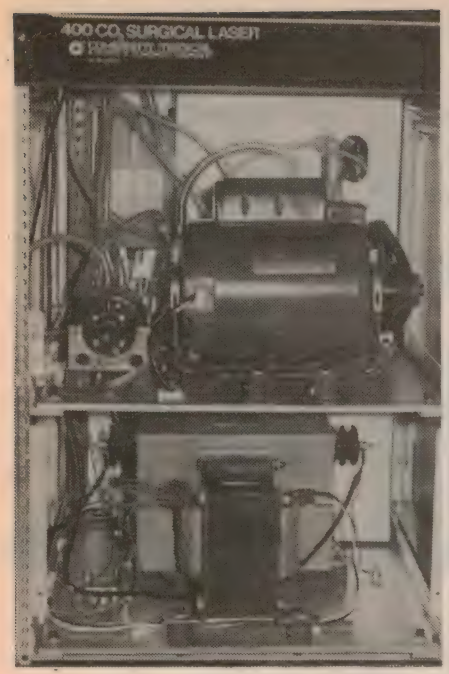
Another simple, but very effective, safety feature concerns the foot button. This is protected by a hood so that accidental operation of the switch is virtually impossible. The operator must deliberately place his foot inside the housing before he can operate the switch.

In use, the surgeon, working through the microscope, places the red spot from the sighting beam exactly where he wishes to begin his cut. When he is satisfied with its position he presses the foot pedal and uncovers the cutting beam. The light itself is invisible, but a small puff

Typical Surgical Laser Equipment



Left: The cabinet of the Model 400 CO_2 Surgical Laser. The power level control is in the centre and the exposure control on the right. The umbilical cord emerges from the top of the cabinet. Right: Rear interior of the cabinet. At bottom left is the gas bottle, middle right the cooling water container and, top left, the heat radiator grille.



Interior of the laser cabinet. The large motor drives a vacuum pump and the small motor the water pump. Behind the transformer is a large capacitor; a part of the laser power supply.

of steam and a mark in the red spot of the sighting beam confirms its presence.

The surgeon then moves the sighting beam slightly, and initiates another pulse. In this way a large cut is made up from a series of small cuts, each one precisely located to make the final cut any shape required, no matter how complex. And, since there is normally no bleeding, the surgeon can work quite fast, in spite of the step-by-step procedure.

At this stage we can perhaps re-state one of our earlier questions: what kind of work is being done with the surgical laser and does its use constitute a real advance?

Doctors, as a class, seldom go overboard for new equipment or techniques. They know, better than anyone, that new techniques have to be proven over a long period before they can be accepted without reservation. Yet, studying even a small part of the medical literature which has been published about the surgical laser, one cannot escape the impression that, underneath the studied objectiveness of their reports, the mood is one of enthusiasm.

Most of the literature concerns pioneering work in the United States, at large medical centres and teaching hospitals, but there is mention of pioneering work by German doctors at the University of Munich and the University of Erlangen.

Another country well to the fore in laser research is Israel. Laser Industries Ltd, of Israel, have produced a 50W carbon dioxide, infra-red surgical laser. This laser is intended mainly for use as a scalpel in major operations, such as abdominal, where blood loss is always a

The safety foot switch showing the protective hood designed to prevent accidental operation.

serious problem.

Professor Isaac Kaplin, of the University of Tel Aviv, is one of the pioneers of laser equipment and laser surgery in that country. He recently visited Australia and demonstrated the equipment and his surgical techniques to Australian hospitals. One unit has been purchased by a Melbourne hospital, two have been ordered by Sydney Hospitals, and one by an Adelaide hospital. Two New Zealand hospitals have also placed orders.

A doctor from the Melbourne hospital (Western General) confirmed that reduced blood loss is a major advantage of laser surgery. He is quoted as saying the blood loss can be reduced by as much as 90 per cent and points out that this feature also makes it ideal for special cases, such as patients with haemophilia.

One of the most exciting uses for the laser, still in the experimental stages when the papers were written, is that first undertaken by German doctors and being followed up by their American contemporaries.

It involves combining a laser generator with an endoscope. The latter is an instrument which is passed down the throat into the stomach and, by means of either a series of lenses, or optical fibres, provides a view of the stomach wall. It is used to confirm the presence of stomach ulcers and to determine whether they are bleeding.

Normally, having confirmed such a condition, it may be necessary to resort to major surgery to correct it. The German doctors hit on the idea of directing a laser beam down an optical fibre endoscope to halt the bleeding by coagulation. Two types of laser have been used; the argon ion laser and the yttrium-aluminium garnet (YAG) laser.

With only a small number of cases treated, many of them "desperate", doctors are understandably cautious about the idea. But they have had several dramatic successes; enough to encourage further investigation.

Another experimental area involves treatment for burns. Severe burns require that damaged tissue be surgically removed, and this usually results in severe loss of blood, in spite of extensive clamping. Laser cuts require minimal clamping and result in much reduced blood loss.

In other fields the experimental periods are over and the techniques are well established. One of these, about which doctors are enthusiastic, is gynaecology; particularly involving tumors of the cervix and vagina. Normal surgery to remove such tumors can be extremely complex, with a high risk of functional impairment.

Dr J. H. Bellina, of the Louisiana State University School of Medicine, was the first to report on the effectiveness of the surgical laser in this role. Conventional treatment would typically involve up to three major operations, with attendant after-care in hospital, high post operative discomfort, and high risk of one or more functional impairments.

By comparison, he was able to treat the same conditions using the surgical laser, in a single operation. Further, the patients were able to leave hospital the same day and experienced so little post operative discomfort that they did not need even mild analgesics. Typically, progress was noted every second day until healing was complete.

He reports that there was a remarkable freedom from infection and that healing was rapid and complete in all cases in 14 days. And, because the surgical laser can be used with such precision, there was minimal damage to healthy tissue and little or no functional impairment.

In Australia the System 400 has been used on a trial basis at King George V Hospital in the Sydney suburb of Camperdown, mainly for the removal of cervical tumors.

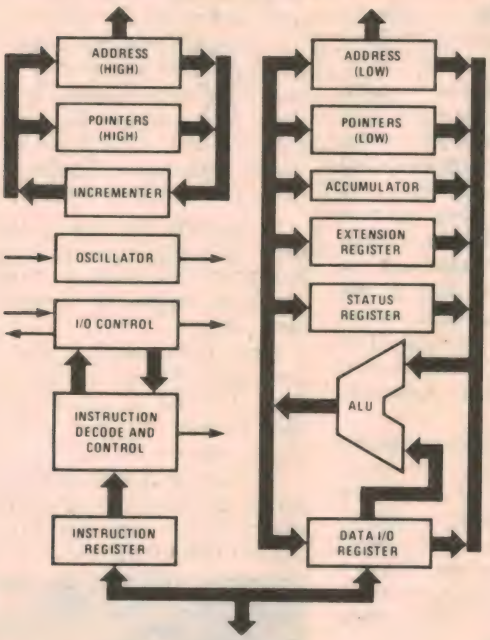
One of the doctors who has used it commented that he was "very impressed", and that "... there is no question that it does a better job than either electro-cautery or cryo-surgery."

He was particularly impressed with the greater precision possible with the laser, since he found it possible to calculate the depth of penetration much more accura-

Another throat condition, called a web, showing partial destruction (dark area) by the laser. The windpipe opening is normal in this case.

Our fast low pitch.

SC/MP II microprocessor



Introducing a new "fast and low" version of our SC/MP: SC/MP II.

Fast! *Twice* as fast.

And low as you can get. In fact, the lowest-power n-channel MPU on the market. 225mW typical.

Another plus is that it now requires only a single +5V power supply.

What doesn't change are the things that made SC/MP so almost-irresistable in the first place. Multiprocessing capability built-in, easy expandability, low parts count, built-in serial I/O register, control flags and sense inputs, built-in delay timer instruction, the availability of good design tools, and a training program that teaches you how to use them.

It's available off your distributor's shelf. And of course, it's cheap. (Otherwise, why would we call it our Simple Cheap Micro-Processor?)

And that's our pitch.

N.S. Electronics
A division of N.S. Distributors Pty. Ltd.
P.O. Box 89,
Bayswater, Vic., 3153

Please send details of your
- ☐ SC/MP II (ISP-8A/600D)
- ☐ SC/MP II Training Program

Name_____
Company_____
Address_____
City_____
State_____ P.C._____

National Semiconductor manufactures a full line of microprocessors, including the 8-bit INS 8080A, the single-chip 16-bit PACE, the bit-slice 16-bit IMP, the four-bit INS 4004, and low cost COPS microcontrollers.

National Semiconductor Microprocessors

tely. This means negligible damage to the adjoining tissue and, in turn, much better healing.

He went on to say that, as well as negligible bleeding during the operation, there is also minimal bleeding after the operation. Post-operative bleeding, while the damaged area is regenerating, is often a problem with such operations when performed by traditional methods.

Another very well established field for laser surgery is that involving the mouth, throat, vocal cords, etc. It has proved particularly useful in removing carcinomas, nodules, polyps, papillomas and similar lesions from these areas.

This application is well beyond the experimental stage; it is now virtually routine. Among the hospitals using it is the Royal Princess Alexandra Hospital for Children, in the Sydney suburb of Camperdown. In fact it was here, with the kind cooperation of the doctors and staff, that we were able to watch the laser unit in operation and take the photographs with which this article is illustrated.

The operation we were privileged to watch was for the removal of a papilloma, a wart-like growth on or around the vocal cords. It is non-malignant, but its presence can be quite serious. It causes a husky voice, noisy breathing (sometimes mistaken for asthma) and, if not removed, ultimate blockage of the windpipe.

Its removal presents several problems. One of the most serious is possible damage to the vocal cords, with permanent speech impairment. This is further complicated by the fact that such growths tend to recur, calling for repeated operations and recurring risk of damage.

Other problems include the difficulty of manipulation within the restricted space of a child's airway (remembering that this has to be shared with the anaesthetist) and the extensive bleeding which can result from conventional surgery.

The laser simplifies many of these problems. The precision which it permits minimises the risk of damage to the vocal cords, while the lack of bleeding is a major advantage. It is ideal for use in the restricted space, where it may be difficult to introduce and manoeuvre conventional surgical instruments.

The doctor observes the working area through the binocular microscope. The patient is fitted with a laryngoscope (a flat funnel shaped tube) with the narrow end towards the working area and the broad end facing the microscope. This device is specially designed for use with the microscope.

Where the foreign growth has been established as benign, such as a papilloma, it may be simply vapourised by the laser. If the nature of the growth is in doubt the laser can be used to cut away a portion of it for examination by a pathologist.

Before the operation the doctor photographs the condition for instructional purposes. The camera is a standard 35mm type fitted with a special lens and electronic flash system. The pictures on pages 13 and 15 were taken with this system.

As already implied, the actual cutting or destruction of the papilloma is done without direct application of instruments. However, small instruments are introduced for other reasons. One is a very thin suction tube which is used to remove debris, smoke or steam, mucus and, occasionally, small quantities of blood. Since moisture inhibits the action of the laser, the working area must keep dry.

Another "instrument" which the doctor used during this operation makes use of these moisture inhibiting qualities. The trick is to protect underlying or adjacent tissue by covering them with a small piece of saline soaked gauze. This improves the precision of laser working still further.

Another trick uses a highly polished metal (probably stainless steel) mirror to direct the laser beam into otherwise inaccessible places. The Children's Hospital is currently waiting on delivery of some mirrors of this type from overseas.

Dr Cohen, head of the Department of Surgery at the Children's Hospital, summed up the performance of the laser as follows: "For selective use, in ear, nose, and throat, this particular laser is magnificent. It can vapourise papillomas, granulomas, and heamangiomas, in the larynx and the upper trachea (windpipe) with minimal scarring. Children with papillomas, particularly, may need recurrent operations, and they get much less scarring and fibrosis than if it is done by traditional methods."

Other doctors, members of the honorary staff, were equally enthusiastic. As well as the points already mentioned they praised the much reduced post operative distress and trauma which such operations normally cause in young children. Also, they can usually be released from hospital within 24 hours.

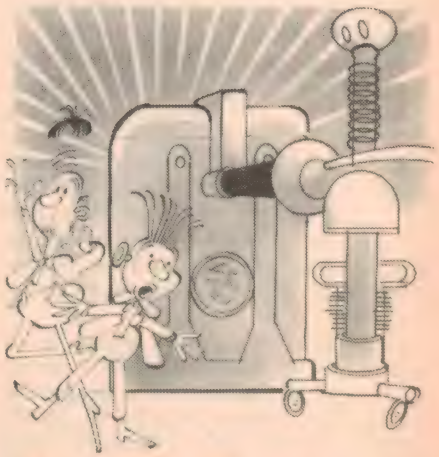
To sum up, laser technology is now well established in the medical field, with several different types favoured for specific applications. What has already been achieved does seem to constitute a significant advance in as much as it has simplified a number of awkward surgical problems.

Even if no further progress was made, achievements to date would seem to justify the developmental effort. In fact, it is more likely that this is only the beginning; that, as more hardware is developed, and as doctors cautiously explore other applications, the laser will make a larger contribution to medical science and the relief of suffering.

In conclusion the author would like to thank the doctors, nurses, and staff of the Princess Alexandra Hospital for Children, and the King George V Hospital for their courtesy and valuable assistance in obtaining photographs and background material for this article.

How the CSIRO measures high voltages

Most electronics enthusiasts rarely measure voltages higher than the mains voltage and, for their purposes, the familiar multimeter is generally considered adequate. But what sort of equipment is required for very high voltage measurements—voltages around 330kV? This article looks at the high voltage measuring equipment developed by the CSIRO's National Measurement Laboratory (NML) in Sydney.



"No Charlie, wait until we get out of the cage before turning the power on!"

Television servicing and manufacturing would normally be regarded as two industries where very high voltage measurements are most frequently made. These measurements are usually in the 20-25kV range. However, in the power supply industry AC voltages up to 132kV are commonplace, and lines of 500kV are in use in Victoria and planned for NSW.

Techniques used to measure these high AC voltages are very similar to those used in electronics. A major consideration is the ability of the impedances used to withstand the voltage applied.

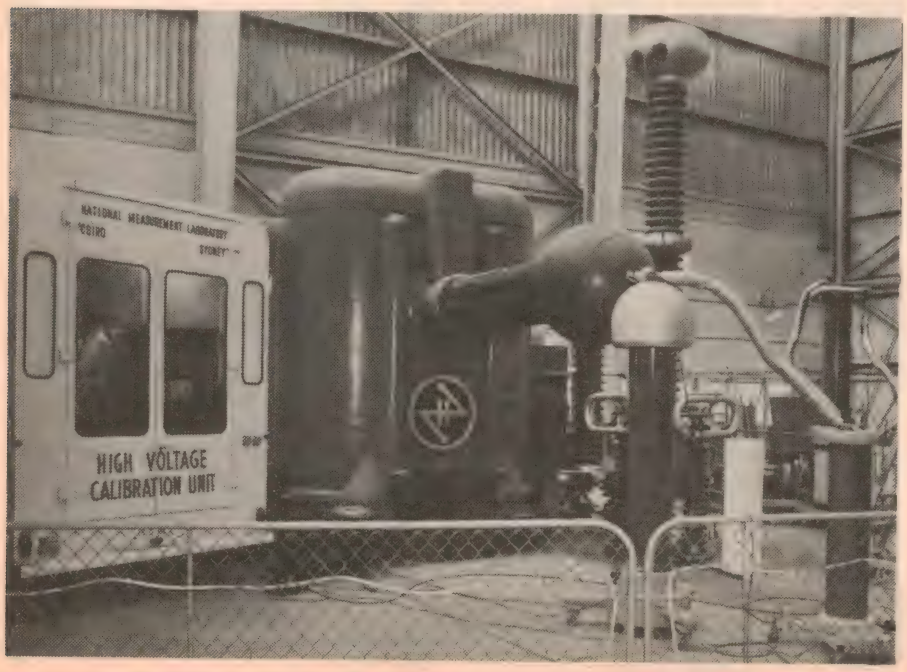
Resistors are not considered satisfactory impedance standards, due to their self inductance and capacitance. Inductors, usually in the form of voltage transformers, have size and weight penalties, so that for precise measurements, capacitors are usually preferred.

Two types of capacitors are normally used: paper-oil and compressed gas. The paper-oil type consists of a large number of individual paper capacitors connected in series and immersed in oil. The series configuration limits the voltage across any one capacitor to a reasonable value, say 1kV; for 100kV we could have 100 0.1uF capacitors in series, giving a value of 1,000pF. These capacitors are mounted in a ceramic or bakelite tube, and for voltage measurement would form the upper arm of a voltage divider. The lower arm of the divider would be a good quality capacitor of, say, 1uF across which an electrostatic voltmeter would be connected.

This arrangement has an accuracy of about 1%. At lower voltages the disadvantages of the non-linear scale of the electrostatic voltmeter can be overcome by using a digital voltmeter.

The compressed-gas capacitor normally consists of two coaxial cylindrical electrodes insulated with a compressed gas. The capacitance is normally 100pF, and the gas may be carbon dioxide, nitrogen, sulphur hexafluoride or some combination. By efficient mechanical design, the electrode system can be made very stable and the voltage coefficient of capacitance very small. The only major variation of the capacitance value is due to temperature. The NML calibration unit carries a 330kV 100pF compressed-gas capacitor for AC measurements, and its capacitance has varied by less than 1 in 10^6 over a long period.

The accompanying photograph gives a good idea of the size of the equipment needed for these voltages. The 330kV gas capacitor on the right is 2.5 metres high, and the paper-oil capacitor with the centre grading ring, rated at 600kV, is 3.75 metres high. The paper-oil capacitor in the left background is a coupling capaci-



Part of the CSIRO's high voltage test equipment at the National Measurement Laboratory in Sydney. The mobile high voltage calibration unit can be seen on the left of the picture.

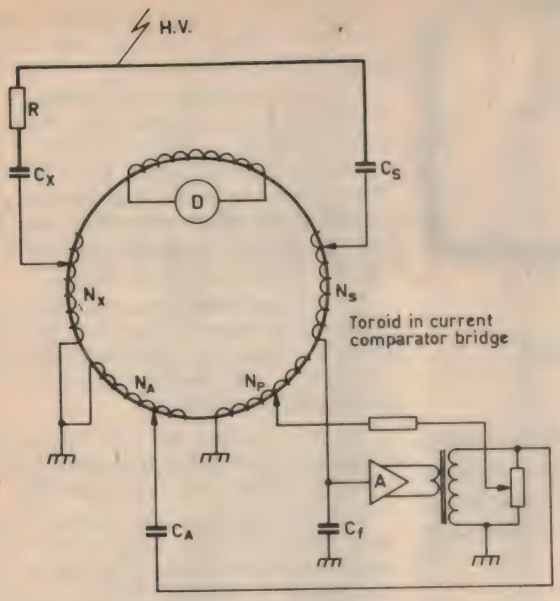


FIG. 1

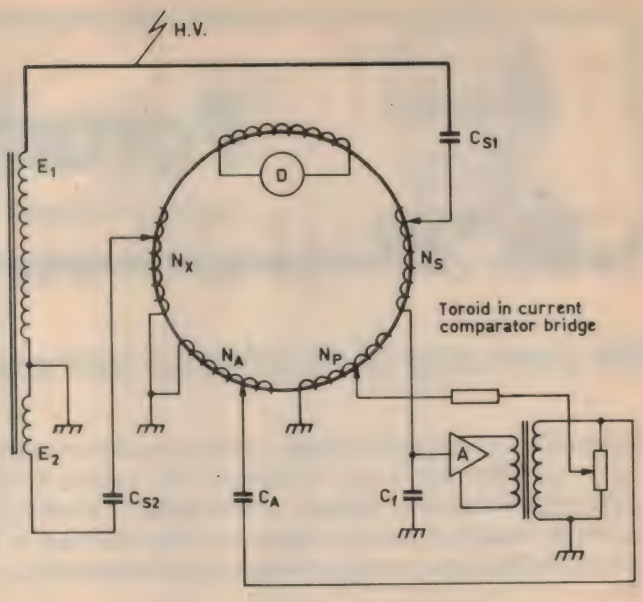


FIG. 2

tor for discharge measurements and is rated at 400kV; and the compressed-gas capacitor on the left is oil jacketed and rated at 575kV.

A test laboratory would experience great difficulty and expense in delivering capacitors to NML for calibration. For this reason, a mobile calibration unit was built to take the measuring techniques to the laboratories.

There is also considerable advantage in having a capacitor calibrated in its usual measuring position, as any possible change in capacitance due to mechanical shock is avoided. The mobile unit is believed to be unique in the standards field and has already successfully operated in Sydney, Canberra and Brisbane.

The most important measurements of a standard laboratory capacitor are its capacitance value and voltage coefficient. The calibration unit is equipped to give these values very accurately by intercomparing the known NML capacitor and the laboratory standard using a current comparator bridge.

The circuit of the bridge is shown in Figure 1. The bridge is in balance when the magnetic flux in the toroid is zero. To obtain six figure resolution, voltage proportional to the supply voltage and in phase is amplified and supplied to extension dials. This voltage is defined by the ratio of C_s and C_f. The amplifier voltage is also used to supply current for phase balance to adjust for the effect of R.

Where a laboratory uses a voltage transformer for accurate voltage measurements, this bridge in another configuration is able to supply an accurate calibration. The circuit is shown in Figure 2.

Voltage transformers have the advantage of high stability and, once calibrated, rarely change. They are used up to very high voltages when size and weight are not a disadvantage.

For DC measurements, a high quality resistor is carried in the calibration unit. A 100 megohm resistance divider with voltage taps at 1V, 10V and 100 volts can be used for DC or AC measurements up to 100kV.

Where resistance is used, a major factor to be considered is the self heating effect which causes the resistance value to change. This particular resistor can be used for 15 minutes at full voltage per hour without changing the accuracy rating of 0.01%.

The NML Mobile Calibration Unit is presently available to industry for:

- high voltage calibration of capacitors to 330kV;
- calibration of high voltage transformers;
- measurement of DC voltages to 100kV; and
- measurement of AC voltages to 330kV.

An impulse divider is being purchased to enable the unit to intercompare impulse voltage dividers up to 1MV. As well, the DC voltage measuring range is to be extended from 100kV to 300kV.

Further information can be obtained from Dr J. Rungis or Mr D. E. Brown at the National Measurement Laboratory, Sydney.

Forum

Conducted by Neville Williams

We just say it to please our masters!

Last month, I referred to some of the less-than-friendly letters that have been generated and directed to ourselves—and to other publications—on the subject of CB radio. Checking through the files, I was reminded of two in particular that seemed to warrant individual comment, because of the charges they levelled at us.

Checking through the files?

The phrase might indicate that we have letters on hand which have not been published and this, in fact, is true. The same would apply to most other magazines and newspapers. Some of them get letters by the basketful. Some of the letters would fill a modest size basket on their own!

While we can't speak for all editors and all publications we at E.A. do read and consider the letters received—whether bouquets or brickbats—because they keep us aware of what readers are thinking and saying. In the jargon of our industry they are the feedback, positive and negative.

Our failure to publish a letter does not mean that we have suppressed the views put forward, just because they happen to be uncomplimentary. There's nothing like controversy, in fact, to spark reader interest.

The reason for non-publication are usually much more pragmatic: pressure on space, limited interest, rambling composition, or the fact that the material duplicates what has already been covered in E.A. and elsewhere.

This last remark was particularly applicable to correspondence about CB radio. CBers on the one hand, and amateurs on the other, spent countless hours discussing and comparing ideas on air. Not surprisingly, when some of them did take time off to commit their ideas to paper, the letters tended to fall into quite distinct patterns, expressing views that had already been publicised and represented to the authorities.

Getting back to the original theme, one of the letters referred to earlier came from a NSW reader who prefaced it with the condition: "If this letter is published, it must not be amended, edited or altered and must be printed in its entirety."

If the letter had not been so prefaced, it may well have been reproduced in full, because it was clearly expressed. In deciding not to reproduce, we were simply upholding the principle, as expressed each month in the "Letters to the Editor" section: "The Editor reserves the right to select letters on the basis of their potential interest to readers and to abbreviate their contents where this appears to be appropriate".

In line with earlier remarks, this provision is not intended as a means of suppressing criticism. If that was our intention, we could simply ignore critical letters altogether. In fact, we publish them frequently, and accept, debate or rebuff the rebuke as appropriate.

No, the whole purpose of the provision is to allow the Editor and his professional staff to do their job on articles, news releases, product announcements and letters alike; to sort them out, tidy them up, eliminate duplication, redundancy and "waffle", and hopefully maximise the reader appeal of the magazine.

So, without identifying the writer or quoting bits from his "forbidden" text, we will discuss the points raised:

Following the preface, he offers a spirited objection to our comment on page 107 of the March issue appended to a reader's letter headed "Antisocial use of CB". This published letter pointed out that a significant portion of American CB jargon is anti police and this is tacit evidence that CB on American roads is used more for law evasion than for "helping the police".

Our comment on the letter as a whole was that the correspondent seemed to be saying that "most people are antisocial, not just a minority. Perhaps you are right" . . . etc.

The objector says bitterly that he could not see how we could possibly come to that conclusion or justify that remark. The original writer, C. Redman of Wallsend, NSW, was referring to people who wilfully and flagrantly break the law, and these could be branded anti-social with some justification. Nowhere was Mr Redman talking about "most people"!

Having re-read the correspondance, I am quite willing to back our Editor's judgment against that of his critic. As I see it, Mr Redman was talking about American motorists generally, their attitudes to traffic authorities and the uses to which they allegedly put CB radio. There is no suggestion that they are non-typical of the American public, and they are certainly not unusual or outside the law in having CB radio in their cars.

It is of such ordinary, ostensibly law-abiding motorists that Mr Redman remarks: "I put it to you that indications are that a (CB) will be abused by an irresponsible majority."

In my book, an irresponsible "majority" of ordinary motorists parallels what the editor said: "most people."

If all this seems a rather trivial matter over which to get upset, it becomes evident further into the letter the writer's real hassle is extreme bitterness about illegal CB operators in Australia and this leads him to voice a particular explanation as to why we publish arguments for (as well as against) CB and why we carry advertisements for CB equipment. His proposition:

We resort to specious and unmoral comment and argument to please our masters and to promote a money-making market in illegal goods. He hopes that we reap a just reward for this contemptible attitude in the way of diminishing circulation!

Whether the writer in question cares to believe me or not, our "masters" in the company know very little about the electronics scene and, in fact, regard our whole operation with some puzzlement: a group of somewhat conservative, boffinish people, dedicated to producing a magazine which only their own kind can understand! It is not so surprising, therefore, that I cannot recollect one single policy direction from "above" in the 35+ years that I have been seated on or close to the top editorial pew.

There have been formal conferences, of course, about printers and printing methods, visual appeal, staff numbers and salaries, charges and costs, and all that sort of thing, with the odd question about aspects of the industry, but never a direction on policy.

As with problems of broadcasting, television and the industry in general, our attitude to CB was worked out at a purely staff level. It was neither automatic nor unanimous; we didn't enjoy the obvious polarisation of long-standing readers over the matter, nor the often-emotive pressures upon us to support CB, condemn it, or to pretend it didn't exist.

In the end, we opted for a pragmatic stance: it did exist as a force on the Australian scene and it could not logically be ignored; there were dedicated opponents amongst our readers, equally dedicated protagonists, and a third group who cared neither way. In due time, the Government would make its own deci-

sion, for its own reasons, and we would react as appropriate.

As for advertisements, I must point out to our critic that, contrary to his assertion, it has not been illegal for suppliers to import, advertise and sell CB-style equipment in Australia. Had it been so, they would have heard about it long before this, one way or another.

This being the case, and in the face of present-day consumer orientated legislation, a magazine is not in a strong position to refuse advertisements for 27MHz equipment. And even if we had done so, and suffered the possible consequences, it would have been but a ripple in the strongly flowing CB tide.

We would merely have taken up a position alongside King Canute of old, while the Government maintained its ambivalent attitude: it's legal to import and advertise and sell, but it's illegal for the buyer to use it unless they have a licence (for which most cannot qualify).

I remember my ageing grandmother: "yes, you can go for a swim . . . but you mustn't go near the water!"

As for falling circulation, I'm relieved and happy to report that sales are currently looking good!

The second letter to which I referred in the introduction is framed in equally caustic terms and for the same basic reason—a very strong anti-CB emotion:

Dear Sir,

I am astounded that one of the country's major electronics magazine can abruptly and completely reverse its editorial policy.

A year or so ago, you were proclaiming that you were one of the major supporters of the Novice Licence and, when it was brought in, were patting yourselves on the back for your part in it.

Now you have completely reversed your attitudes to the novices, even to the extent of condemning them in not presenting all the facts, leaving out details so that the whole sentence and indeed article has a biased slant. In one case, the statement about amateurs in general is completely incorrect and shows a bias to those who are breaking the law; a deliberate attempt to mislead the public.

I refer in particular to the March issue and the article "The 27MHz Scene" in which the amateur is deliberately slandered. The passage "While the amateur . . . enjoyment is being compromised" (page 41) suggests to the reader that the amateur operator, if he is causing interference, will sit back and say "It's not my worry, mate". While the pirate who is causing interference will immediately jump up and fix the problem.

It is painfully obvious that you have not researched your statements. In the "Handbook For Operators of Radio Stations in the Amateur Service", I direct your attention to paragraph 69. In this, it is stated that, if the amateur radio operator causes interference, he must immediately cease all transmissions, except for brief tests, until the problem is fixed.

The letter, over the signature of S.B. (West Pymble, NSW) goes on further but I pause to comment on what has been quoted (with some abbreviations).

It is the clear responsibility of a writer or a lecturer to avoid ambiguities, as far as possible. But with all the goodwill in the world, I simply can't read into the text the meaning which S.B. professes to see.

The reference flowed from an article detailing the erection of an outdoor 27MHz 5/8-wave antenna. While it was originally intended for the CB market in the USA, I venture to suggest that the people most likely to erect such an identifiable structure, in Australia in March '77, would be those referred to at the head of the article—full or novice amateur licencees.

Discussion of a large gain-type antenna led naturally to mention of TVI interference problems, which are very real on 27MHz, even with low power transmitters. So we went on to mention a couple of items which were available to combat interference—a low pass filter intended for the transceiver output circuit, and a high pass filter for the TV input circuit.

Our "sin" was apparently in mentioning that these items had been developed originally for use by CB operators overseas—a simple statement of fact. But to S.B., it's a subtle plug for those he dislikes so heartily:

Because CB-style filters are available, Australian "pirates" will jump up and fix interference problems. Amateurs would not be so helpful.

Come off it . . . S.B!

But to get back to the paragraph which is supposed to be so biased, so incorrect, so misleading, so slanderous and so painfully indicative of our lack of research. Just ahead of the par in question, we had mentioned a number of improper conditions in a transmitter which could cause TV interference and concluded "situations like this are the responsibility of the person operating the transmitter"—again a simple matter of fact.

Then, in a separate par, we went on to list limitations in the receiver design which could cause "TVI problems". Relative to these receiver limitations, we said "While the amateur operator may legitimately take up a 'my transmitter's okay' position, it doesn't make it any easier to live alongside neighbours whose TV enjoyment is being compromised".

I should have thought that the implication was clear from this par and what followed: an amateur would not want to ignore his neighbours' problems, even though the amateur gear was above reproach. Therefore he could logically take advantage of filters which had been developed overseas to cope with the exact same 27MHz/TVI problem.

As for the wording and interpretation of the regulation, S.B. seems to be saying that, legally, as soon as an amateur is made aware of interference (the word is

FORUM: We say it to please our masters. . .

unqualified in his letter) the amateur must cease transmission forthwith and, except for test purposes, not resume transmission until the trouble is fixed (presumably, until the interference is eliminated).

To double-check the position, I have since talked the matter over at length with a radio inspector in Sydney, who made the following points:

1. His department is concerned primarily with interference to "the reception of broadcasting and television programmes" (Regulation par. 69). Problems of interference into other electronics equipment, such as tape recorders, hifi amplifiers, etc are outside the Department's jurisdiction, except where the offending transmitter is operating illegally or improperly. Such problems normally result from inadequate RF filtering or shielding of the circuitry being interfered with, and are the responsibility of the owner and/or supplier, not the operator of the transmitter.

2. The Department prefers to see TV and radio interference problems sorted out unofficially and amicably by the parties concerned but, in a confrontation situation, an amateur does not have to accept a complaint from a private citizen as an order to cease transmission. In the ultimate, any such order must logically come from an officer of the Radio Branch, acting on a complaint.

3. Where the Department is involved, the Radio Inspector may order the amateur to stay off the air until tests can be conducted to determine the cause of the problem. If the transmitter is at fault, it has to be put right. If the problem is in the receiver (as specifically envisaged in our March article) and the owner is unwilling or unable to have it rectified, the amateur may be authorised to recommence transmission, notwithstanding the interference. The Department is not prepared to penalise an amateur—or the operator of any other legal and trouble-free transmitter—for the shortcomings of a receiver design.

4. As an arbitrator, a radio inspector can be most helpful where the parties are cooperative. Where either or both are intractable, the inspector has to make a decision based on his technical findings, and the parties have to live with any unpleasantness.

As an example of how things work in practice, I quote the case of an amateur I know, who set up a 6-metre transmitter in a block of high-rise apartments in one of Sydney's inner suburbs. When he first pushed the talk button, he wiped out about half the TV sets in the units. When alerted to the problem, he did the rounds and fitted a length of ribbon to each set, cut to act as a trap on his frequency. It was a pure front-end overload problem and the traps eliminated it completely.

All except in one unit, where the owner refused to allow any "two-bit troublemaker" to tamper with his new and expensive receiver. Instead, he complained officially to the Radio Branch. When the Inspector arrived and summed up the situation, he advised him to accept the proferred cure but the complainant refused, with mutterings that he would take the matter further. Whereupon the Inspector cleared the amateur to operate "to his heart's content" on the basis "he'll come knocking on your door". Which the complainant did, about a month later with the request: "please fit one of those gadgets!"

In the light of the foregoing, I would respectfully suggest to S.B. that our paragraph in the March issue is really a pretty accurate summary of the way in which the regulations operate in practice.

S.B. also sees as an attack on amateurs a brief answer to a number of questions posed by a reader interested in obtaining a Novice Licence. On page 107 of the March issue we said, inter alia, that "Also amateurs can strictly only discuss technical matters". This earns the rebuke:

That is a load of hogwash. If you care again to open your regulations handbook you will see in paragraph 79 the following statement: "Transmissions . . . will be limited to messages of a technical nature related to experiments being conducted . . . and to remarks of a personal character for which, by reason of their unimportance, recourse to the public telephone service is not justified.

"Again, this has shown . . . a bias against the amateurs . . ."

In the specific criticism S.B. is on firmer ground than in his earlier foray, because our remark probably does reflect a traditional amateur attitude to use the bands. In practice amateurs do tend to concentrate their discussion around their equipment and their activities and to be guided by another rule in the Handbook, par. 77:

"The use of radio stations in the amateur service shall, as a general rule, be confined to technical investigations, research into or instruction in radio communication techniques without pecuniary interest."

I agree that the word "strictly" in our reply is inappropriate. It would have been better to use the official phrase "as a general rule".

As for S.B's other remark "again . . . this has shown a bias", the "again" is inappropriate because his first major criticism was shown to be invalid. To reach his second, he passed completely over our plug for the WIA courses and our expressed hope, since fulfilled, that the Novice licence would not be limited by a 2-year tenure.

But why spoil a good "bias against" for the sake of a couple of "bias fors"?

Pioneer's highly refined SA-9500II stereo amplifier has many features

Pioneer Electronic Corporation continues to produce increasingly attractive high fidelity equipment. The new SA-9500II stereo amplifier, for example, has dual power supplies, twin tone controls, selectable load resistance and shunt capacitance for the phono inputs and a precision volume control. Power output is conservatively rated at 80 watts RMS per channel into 8-ohm loads.

The SA-9500II is a refined version of an already successful amplifier from Pioneer. We reviewed the HG version, which is produced by Pioneer specially for the Australian hi fi market. It conforms to Australian wiring practice and is supplied with a detachable three-core mains flex with moulded three-pin plug.

With regard to styling, presentation and finish, Pioneer must be right up amongst the leaders. The SA-9500II is impeccably finished. All the controls work with a silky smoothness that just cannot fail to impress. Even those who are turned off by the impressive array of knobs and controls have to admit that the presentation is superb.

All the usual features expected on expensive stereo amplifiers are to be found on the SA9500II, plus a few others. Of particular interest are the twin bass and treble controls, which allow independent adjustment of the lower and upper treble and bass ranges. Pioneer give comprehensive instructions on their use. Sensibly used, these controls are quite effective and useful in correcting small program and source deficiencies.

Two admirable refinements are the small rotary switches which select the shunt capacitance and resistive load for the phono inputs. These are features which up till now, have only been found on the most expensive and esoteric separate preamplifiers. In including these switches, Pioneer have recognised the fact that most magnetic cartridges have an optimum resistive load and shunt capacitance.

The shunt capacitance selector has four settings, marked 100pF, 200pF, 300pF and 400pF. These settings carry the assumption that the connecting cable capacitance is the now standard value of 100 picofarads in each channel. Consequently, the 100pF setting of this selector adds no capacitance to the phono input.

Perhaps the best feature of the control panel is that large and imposing volume control knob. It rotates so smoothly and seductively, with those 32 little detents of just the right firmness. Anyone with the purchase price of the SA9500 in his pocket is likely to swoon as soon as he grabs it.

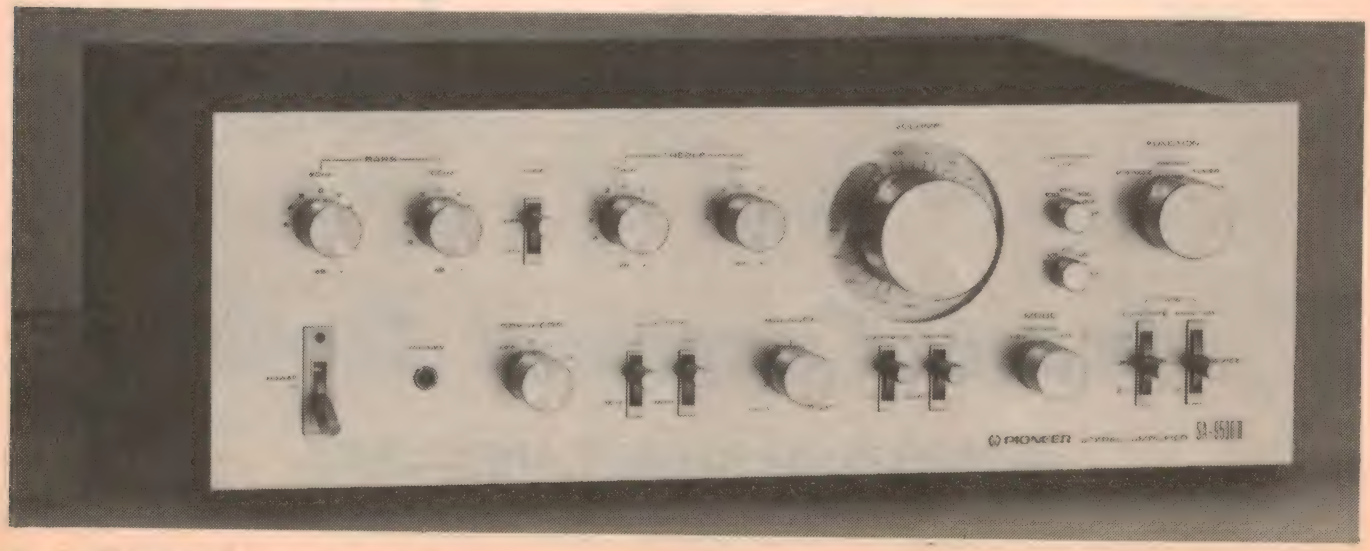
Back to reality. Apart from its tactile sensations, the volume control has technical justification. Each detent gives an approximate 2dB step and the tracking between the two potentiometer sections, is precisely maintained at better than 0.5dB over the whole range of rotation. The fact that each detent in the control gives an approximate 2dB step means that it is smoothly progressive in operation at anywhere between its extremes. Excellent!

Some of the other controls cannot be so easily justified. One is the loudness switch, about which our negative feelings should be well-known by now. Two others are the low and high filters. These offer so little in the way of audible or measureable effect that they are a waste of two good switches. The Low filter gives −2dB attenuation at 15Hz and −10dB at 5Hz. Similarly, the High filter gives −3dB at 8kHz and −6dB at 15kHz.

In spite of a relatively uncluttered layout, internal accessibility is not one of the strong points of the SA9500II. When we blew the mains fuse, we had trouble finding and then replacing it. The same could be said of many other components. The protection relay, for example, is audible, but invisible—it is buried under the tone control board.

A look at the circuit diagram which is included with the comprehensive manual shows many interesting circuit features.

One of the most interesting and perhaps most controversial features of the Pioneer SA-9500II is the dual power



supply. This employs two power transformers and four 12000uF 63 volt electrolytic filter capacitors. This must add up to quite an appreciable increase in cost for an improvement in performance which, in terms of the measured figures, is negligible.

Basically, the arguments in favour of dual power supplies resolve into a potential for improved channel separation. It might be asked whether channel separation in most amplifiers needs to be improved. After all, figures for separation between channels of greater than 50dB are expected and achieved with most good quality amplifiers. Does it need to be better?

The answer to this question is yes, on two counts. For a start, there are quite a few FM tuners and tape recorders with channel separation of 50dB or better. If the amplifier is not to degrade the signal quality as far as separation is concerned, the equivalent figure for separation should be at least 60dB (over at least the midrange frequencies).

But the absolute figure for channel separation is not the whole story. In most amplifiers the major source of crosstalk is via the common power supply and is due to the asymmetrical current drain characteristics of the class-B power stage. The resulting crosstalk residual signal is akin to second-harmonic distortion of the signal in the driven channel.

Thus in an amplifier with a common power supply an otherwise excellent figure of 60dB for channel separation might be interpreted as producing a crosstalk signal equivalent to 0.1% second harmonic distortion of the signal in the driven channel. Add to that the worst effect of intermodulation distortion products, and it can be seen that there is a good argument for dual power supplies.

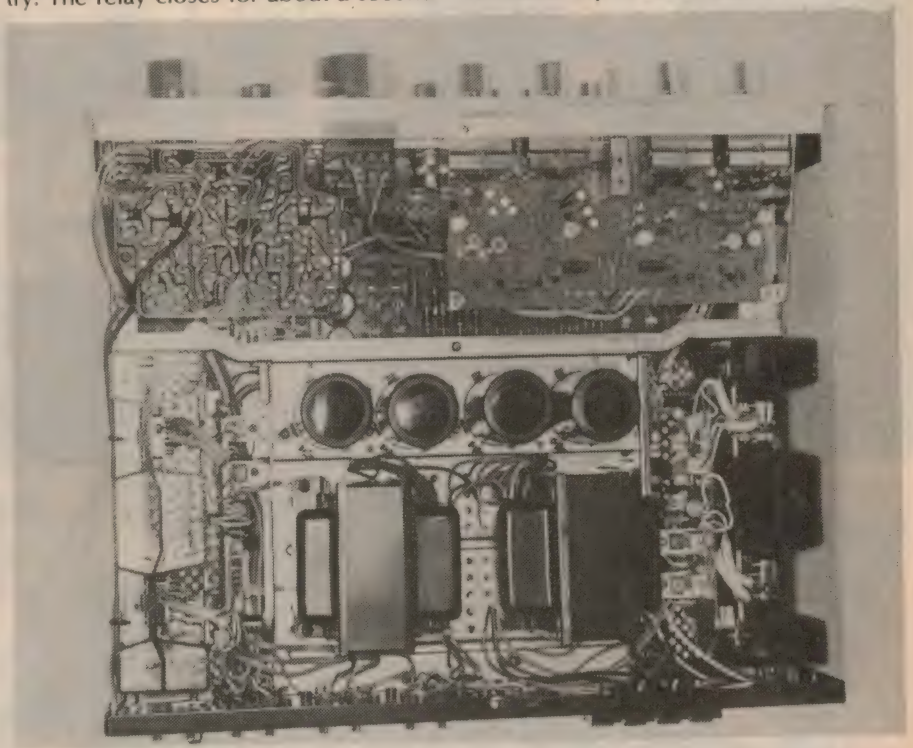
In the SA-9500II the dual power supplies feed only the class-B output stages and all the other circuitry is fed from well regulated common supplies. The resulting crosstalk figures with respect to full power are: 45dB at 10kHz, 60dB at 1kHz and 63dB at 100kHz. These figures were taken with a 4.7k resistor loading the undriven channel input. No distortion was evident in the crosstalk signal.

The phono preamplifier employs a differential amplifier stage driving a push-pull class-A output section. The circuit runs from ±30V supply rails which gives excellent dynamic range. A differential amplifier stage is also used at the input to the tone control section but the following stages are single-ended class-A (i.e., simple common-emitter amplifiers.)

The power amplifier circuitry is quite different from earlier circuits used by Pioneer, including that in the similarly rated SX-950 stereo receiver which we reviewed in November 1976. The usual differential amplifier input stage is followed by a second differential stage which provides additional gain and acts as a "current mirror" class-A predriver stage. This is an adaptation of IC technology which has been used in a number of recent amplifier designs.

Four large plastic encapsulated power transistors are used in the output stage of each power amplifier. They are parallel connected in complementary symmetry mode.

Protection and muting at switch-on and switch-off is provided by a relay and associated transistors. Two transistors monitor the output current of each power amplifier. If the current becomes excessive the appropriate transistor conducts and turns on the relay drive circuitry. The relay closes for about a second and then opens again. If a short circuit is maintained across the output, the relay continues to cycle on and off, delivering short bursts of current. As soon as the short circuit is removed normal operation resumes. The protection circuitry also protects the loudspeakers against fault conditions in the amplifier.



We found one problem with the protection system in that it does not protect against overdrive or load values below 4 ohms. If, for example, the amplifier is required to drive a 2-ohm load at high power (as would result when driving two 4-ohm loudspeaker systems in parallel) the main 240VAC fuse blows. We also blew the fuse several times when testing full power output into 4-ohm loads.

Reference to the manual shows that the wrong value has been specified for the 240V mains fuse for the HG model which is to be sold in Australia. It is specified at 2 amps, a rating which could be exceeded when delivering full power into 4-ohms with both channels driven. A more realistic rating would be 3 amps. The American S model is supplied with a 4 amp 220V fuse.

No spare fuses were provided. This was irritating since the miniature fuses are hard to obtain and expensive, as well as being hard to get at.

We began our tests with a one hour preconditioning with the amplifier delivering 30% of rated power into 8 ohm loads. This is roughly equivalent to the maximum dissapation condition in the output transistors, and can eliminate an amplifier with inadequate heatsinks.

Apparently the "chimney" heatsinks in the SA9500II are entirely adequate. The case temperatures of the output transistors ranged about 75 degrees Celsius above ambient—a reasonable temperature under these conditions. The ventilated top of the amplifier was warm, but not hot to touch. Under normal conditions the amplifier remains cool.

Maximum power tests at just before the onset of clipping yeilded the following results: 52 watts into 16 ohm loads; 97 watts into 8 ohms and 138 watts into 4 ohms. As would be expected with the dual power supply feature, the results were the same whether one or both channels were driven.

Rated distortion is less than 0.05% at full power and quoted at less than 0.01% at lower powers. Suffice to say that the distortion was in fact below our measurement limit of 0.02% over the audio range.

Frequency response checked out at between 5Hz to 30kHz at the −1dB points. The tone controls checked out exactly as specified. Each tone control gives an interaction at 1kHz of less than 1dB with the total response deviation at this frequency at the worst setting of the controls being 1.5dB. The main tone controls give ±8dB at 100Hz and 10kHz with a "shelved" response beyond these

(Continued on page 117)

TDK MAKE YET ANOTHER BREAKTHROUGH!

A.D. is here

NEW TDK AD could do more for your Hi-fi system than $1,000 worth of better equipment.

TDK's SA (Super Avilyn) made chrome dioxide tape obsolete. Now, in normal bias setting, or in all machines which are not equipped with a bias change switch, **TDK AD (Acoustic Dynamic)** will make your hi-fi gear sound like it's never sounded before. Wait till you hear what you've been missing! Because of AD's superior dynamic range at the critical high end, you'll hear any music that features exciting "highs" with amazing brilliance and clarity that you won't get with any other tape (except TDK's top of the line SA).

Read what Louis A. Challis & Associates Pty. Ltd. say:

"TDK AD tape generally provided the lowest harmonic distortion and indicates the tape's ability to provide higher quality sound at the same time as giving extended frequency range on medium or low quality machines."

"(Of the four premium tapes tested) TDK AD had by far the best drop-out characteristics, being equal to the best we have ever seen."

TDK AD is not only a breakthrough in tape technology – it features the jam-proof, friction-free precision cassette shell already released with TDK SA. Just as much attention has been paid to the cassette housing and mechanism as to the tape inside.

Truly the machine for your machine! At all good hi-fi stores and record bars.

TDK® AD (Acoustic Dynamic)

SOLE AUSTRALIAN AGENTS:
CONVOY INTERNATIONAL PTY LTD
4 DOWLING ST WOOLLOOMOOLOO 2011
TEL 357 2444 TELEX AA23111

C1-P-1

"DE-CLICK" YOUR PHONO RECORDS WITH THE SAE 5000

SAE, the California-based Scientific Audio Electronics Company, have come up with a unit which should bring joy to the hearts of all those who spend sleepless nights worrying about the clicks and plops from their disc records. Its one job in life is to eliminate clicks and plops!

by NEVILLE WILLIAMS

The brain-child of SAE engineer Jack Sacks, the new SAE 5000 is intended to couple into the tape monitor facilities of existing hifi amplifiers or receivers, be adjusted for sensitivity, and thereafter be largely forgotten. There, it remains constantly and instantly alert, for any component in the signal path that looks like a click or a plop, whether it comes from a disc being played locally, or from a program being radiated by an FM station. It snips each one out, glosses over the hole in the program whence they came, and leaves the listener blissfully—and hopefully—unaware of its good deeds.

But if the listener is a real masochist, he/she can flip a switch on the unit and have it deliver to the amplifier, not the program, but the noise pulses it has obligingly extracted!

In introducing the new SAE 5000 "de-clicker" or "de-plopper", the maker's literature is at pains to stress that what follows is not intended as a put-down for the commercial phonograph record.

A vinyl pressing still has the potential to offer excellent fidelity and the highest signal/noise ratio available on the domestic mass market. But that potential is not always realised, for a variety of reasons:

- The material actually recorded on to the disc may contain a significant amount of hiss, arising from problems in the mastering procedures.
- The record master itself, the pressing routines or the quality of the vinyl used for the pressing can add a continuous or semi-continuous noise component.
- A chipped, worn or over-weighted stylus can roughen the groove walls, leading to a gradual increase in background noise.
- As distinct from "continuous" background noise, blemishes in the master or dies, impurities in the vinyl, surface scratches, dust particles and even static discharges can cause sharply defined clicks and plops. These can be most objectionable in records that have been heavily used—or abused—but they can also be a problem in new pressings for those who expect their prized discs to produce "music out of silence"; and this despite improvements in record care and record playing equipment.

The SAE literature points out that various techniques have been applied to minimise background hiss or other "continuous" noise when producing from disc or tape recordings. Virtually all of them—Dolby, ANRS, etc—manipulate the bandwidth and the dynamic characteristics of the record and/or reproduce equipment so as to have a minimum effect on the wanted signal, with maximum discrimination against the unwanted background noise.

However, none of the systems has more than an incidental effect on staccato clicks and plops.

In a specific attack on clicks and plops, Jack Sacks carefully compared the electrical signals they produced with that of normally recorded sound. He found that, whereas normal music transients exhibited a fast rise time and slow decay, clicks and plops had fast rise times and fast decay times as well. Again, clicks and plops tended to produce distinctly out-of-phase signals in the two stereo channels far more consistently than did music transients.

Taking advantage of these and other observations, he developed logic circuitry which could continuously monitor signals and react within a tiny fraction of a second to anything that satisfied the criteria for a noise pulse. As the SAE announcement says:

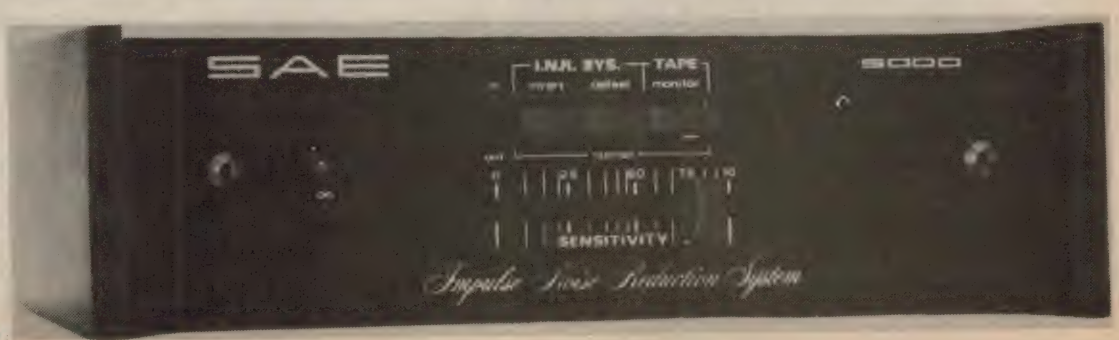
"This logic circuit and its associated algorithm (program set) are the heart of the 5000. Through careful evaluation of several parameters simultaneously, the logic circuit can detect the presence of impulse noise, even under the most demanding musical conditions and keep to a minimum potential mistriggering."

Immediately, the logic circuit detects the presence of impulse noise—or at least within 1 millisecond—it activates the noise removal circuit. It does so by completely interrupting the music program for the duration of the pulse—an operation which clearly indicates the use of high-speed electronic switching.

However, the switching does not simply leave a hole in the program, because that would substitute one kind of pulse for another. The same switching operation which chops the input signal substitutes a segment of the signal which immediately preceded the incident—a function that suggests the inclusion of a "bucket brigade" delay line as a constantly available source of substitute signal.

Hopefully, the listener will not even notice the substitution. He may never know that clicks have been removed, unless he goes back over the same track and listens to the "noise" output from the 5000.

Manufacturer's specifications for the SAE 5000 are as follows: Rated output 2.5V RMS; output at clipping greater than



A front view of the SAE 5000 "de-clicker", more correctly the INR or Impulse Noise Reduction System. Switches are for "Invert", "Defeat" and "Monitor" while the slide sensitivity control should be adjusted for best results.

b.w.d

top forte

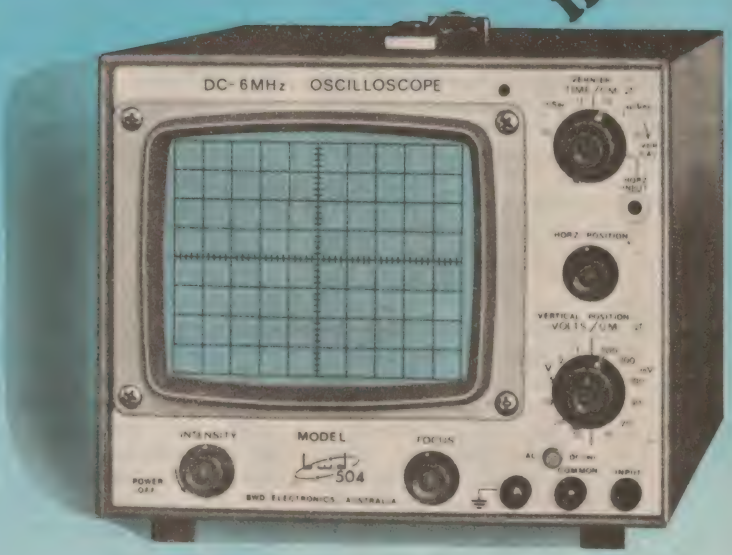
BWD540
Dual Trace
DC—100MHz -3db
5mV sensitivity
5nSec. sweep speed

Computers, μ-Processors, Research and development, Field service

EXHIBITING ON STAND 52 IREECON '77

BWD539D
Dual Trace
DC—25MHz -3db
5mV sensitivity

Colour TV, C.B. Radio, μ-Processors, Video & audio recording.



BWD504
DC—6MHz
10mV sensitivity

Education, Hobbyists, X-Y monitor

BWD ELECTRONICS PTY. LTD.

Miles Street, Mulgrave, Victoria, 3170
Telephone 561 2888. Telex 35115

N.S.W.	Amalgamated Wireless (A'asia) Ltd., Sydney. Phone 888 8111
QLD.	Warburton Franki (Brisbane) Pty. Ltd., Phone 52 7255
S.A.	Protronics Pty. Ltd., Adelaide. Phone 51 4713
	Rogers Electronics, Adelaide. Phone 42 6666
W.A.	Cairns Instrument Services, Perth. Phone 25 3144
TAS.	Associated Agencies Pty. Ltd., Hobart. Phone 23 1843

FP376B

9V RMS into 10k ohms; total harmonic distortion, at rated output, less than 0.1% between 20Hz and 20kHz; intermodulation distortion up to rated output, any two frequencies 20Hz to 20kHz at 4:1 ratio, less than 0.1%; signal/noise ratio greater than 90dB below rated output; frequency response ±1dB, 20Hz to 20kHz; input impedance 75k ohms; output impedance 500 ohms; insertion loss less than 1dB.

Dimensions are 273mm x 76mm x 93mm and a rack mounting kit is available if required.

The unit has its own tape monitor connections at the rear so that, in being connected permanently to a domestic stereo system, it does not deny access to other units.

One overseas report on the SAE 5000 confirms that it can indeed be added to a stereo system virtually on a fit-and-forget basis; further, that it does a very commendable job of removing the occasional click from good quality discs, virtually without the listener being aware of what has happened. When the disc is poor, however, requiring the de-clicker to operate repeatedly in a short period of time, the "patches" do become collectively audible.

But then, I guess, the original clicks might have been even more obvious.

One obvious question, which yet remains to be answered is whether collectors of old recordings will find it to be a handy tool in reclaiming and re-recording some of their ageing discs.

The manufacturers, SAE International, are represented in Australia by Leroya Industries Pty Ltd, 156 Railway Parade, Leederville, W.A. 6007.

"SUPER" LOUDSPEAKER?

In 1962, former concert violinist John Berry met up with hifi salesman Les Barcus and sought his assistance in attaching some kind of electrical sound pickup transducer to his violin. In working out the problem, the two realised that they might have hit upon a potential field for a business venture and, twelve months later, they set up a company to market the Barcus-Berry transducer.

The venture flourished, and their transducers were applied to all manner of musical instruments, ranging from flutes to bass drums, but in particular to rock guitars which needed the option of reinforcement through high-powered amplifiers. Last year, their plant in Huntington Beach, USA, provided employment for 60 people and netted $2 million dollars in sales.

But that's merely where the present story begins.

Without any special objective in view, and while tinkering in their lab, Barcus and Berry wired a power transducer to a small sheet of glass and applied audio drive. What resulted set them both back on their heels—clean, wide-ranging sound that seemed to differ in quality

REPLACEMENT STYLI FROM EEI

Elite Electronics Industries Pty Ltd—EEI—claim that they are in a position to take much of the hassle out of hifi stylus replacement. They are offering complete assemblies fitted with a precision parabolic stylus which, they claim, can offer better sound with up to five times the playing life of the ordinary elliptical.

Elite Electronics stress that their approach to stylus replacement is not based on the idea of substituting a new diamond for the worn one on the original cartridge cantilever. Experience has shown, they say, that hifi enthusiasts do not like having to disable their system by having to despatch the worn stylus assembly, or the complete cartridge, to a distant repairer. They would much prefer to obtain a new stylus assembly, where this is available, and change it over themselves.

They are not left without music for several days and the old assembly remains on hand as an emergency spare.

While a replacement stylus assembly would be available in most cases from the distributor of the particular brand of cartridge, Elite Industries feel that they are able to offer a most attractive alternative.

Manufactured in Japan, their stylus assemblies are exact mechanical replacements for the original item but they are tipped with a precision ground parabolic stylus, which owes its shape and concept, to some degree, to the intensive research which went into styli for the CD-4 quadraphonic system.

As illustrated in the accompanying line sketches, if the shoulders of a stylus in contact with the groove walls follow a simple radius curve, the actual area of contact is very small—two points which become temporarily enlarged as the tip passes, because of the elasticity of the groove walls (left).

In these circumstances, with the downward stylus thrust supported by two very small contact areas, there is a tendency for accelerated wear of both groove and stylus, with the danger that the groove walls may be permanently scarred if the pressure per unit area exceeds the elasticity limits of the vinyl. And, while the problem can be lessened by specially designing cartridges for a minimum tracking weight, EEI stress that merely using a cartridge at less than its intended weight, does not necessarily help matters. If a stylus begins to mistrack because it is not held firmly in contact with the groove pattern, it can actually cause more damage as it jumps from peak to peak.

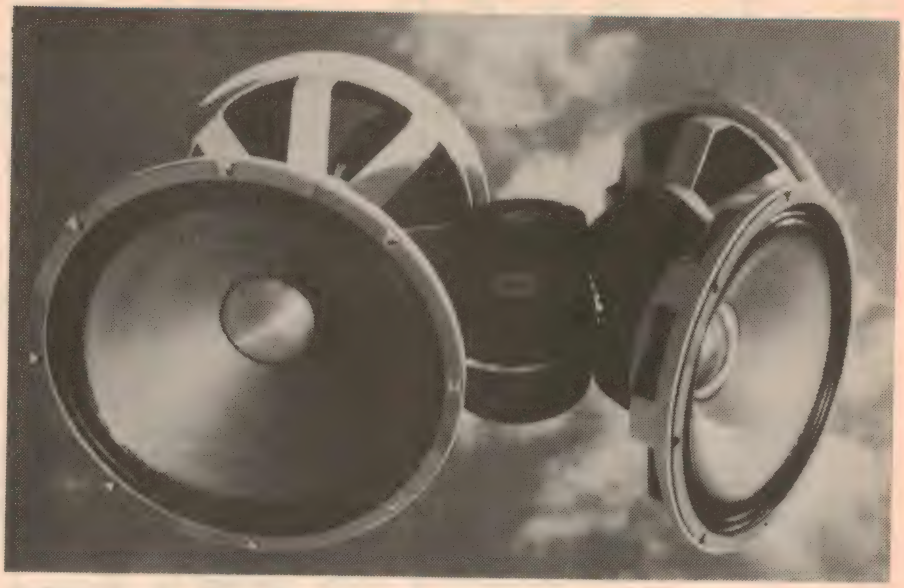
By contrast, parabolic styli tend to be more wedge-shaped (right) with a large-radius curve in contact with the groove walls. The contact area is enlarged vertically along the groove wall, distributing playing weight, reducing stress on the vinyl and the likelihood of fracturing the surface structure. Groove wear is reduced, according to EEI, and so is stylus wear, by a very considerable margin.

Consistent with this, EEI suggest that prestige cartridges, designed for very low playing weight, be used with a playing weight towards the top rather than the bottom of the recommended range, provided this does not exceed 1½ grams. The anti-skating adjustment, however, should be set for less than its normal proportion of the playing weight.

The range of styli offered is being increased but those listed at the time of writing include styli for the following cartridges: EEI series 500; Shure M75ED, M91ED, V15 III; ADC VLM-XLM; Stanton 681EE, EEE, 680EE; Pioneer PN 11, PN 12, PN135. Prices range from $34 to $50, depending on the unit, plus $1.50 P&P and insurance. There is a 6 months guarantee against faulty workmanship.

Replacement styli by EEI are accessible to all normal hifi outlets. Inquiries for further information can be directed to: Elite Electronic Industries Pty Ltd, 36 Luxmore St, Cheltenham, Vic 3192; phone (03) 93 1201. In New South Wales to Townshend Electronics, Box 185, P.O., Rozelle 2039; phone (02) 827 2937.

HIFI NEWS—continued



Designed by the Cetec Corporation in the USA, "Gauss" brand loudspeakers are intended especially for high quality musical instruments, studio monitors and high power public address. Available with nominal diameters of 12, 15 and 18 inches, they have ratings up to 200W RMS continuous. A companion unit is a wide-range compression driver with a 2-inch throat entry and a fibreglass diffraction horn. For further details of the Gauss range, contact Importronics Australia, 60 The Esplanade. Maribyrnong, Vic 3032. Telephone (03) 317 7977.

from anything they had been used to, issuing from ordinary loudspeakers.

They were so fired by the idea that they decided to more than double the size of their plant and to launch, in a big way, into the manufacture of the Barcus-Berry "AudioPlate". In fact, the operation is already under way, with a chain of franchised distributors being set up across the United States and abroad.

The AudioPlate is described as a slab of ordinary plate glass, about 180mm long, 130mm wide and 7mm thick, to which is attached a 25mm square transducer. Without appearing to vibrate and without appearing to be affected by a hand placed in contact with its surface, the AudioPlate can reproduce frequencies way above the audible range, while avoiding the point source effect of conventional loudspeakers.

At least, that is what one news report says.

The report also suggests that many acoustic experts are baffled by the way the device works, but Professor Roy Ayers of the Long Beach State University is quoted as saying that he believes that the energiser causes the plate to bend and "sets up wave disturbances in the glass and the motion disturbs the air, to produce sound".

One would hope that Professor Ayers has merely offered a straightforward explanation of the AudioPlate, rather than seeking to add to the "mystery", as might have been inferred from the context of the news report.

In actual fact, power transducers

HIFI NEWS BRIEFS:

- BASF Australia Ltd., and Maurice Chapman & Co. Pty. Ltd., have agreed that, from July 1, the marketing of BASF magnetic recording products would be handled by BASF Australia Ltd. This will conclude a 27-year association, during which Maurice Chapman & Co has been sole Australian distributor for BASF tapes, cassettes and professional audio and video recording products. This new arrangement is in line with the company's policy to become directly involved in consumer market areas, linking with the direct distribution of existing EDP storage media.

- Effective 1st June, Sonab of Sweden Pty. Ltd., took over the marketing in Australia of the products manufactured by Empire Scientific Corporation. Principal activity will centre around the Empire range of phonocartridges. Current models available are the 2000 series (2000E I, E II, and E III); and the new super cartridge, model 2000Z. A full range of replacement styli will be carried. For further information on the Empire range, contact Sonab of Sweden Pty Ltd, 13 Rickard Rd, Narrabeen 2101.

intended to excite plane panels have been around for many years and, amongst other things, have provided the basis for "talking pictures"—ostensibly ordinary pictures, hung on the wall, from which emerge speech and music.

There is no reason at all why a power transducer should not excite a piece of glass—or whole window pane for that matter—just as easily as it does a sheet of plywood or composition board.

Nor is any such combination exempt from the ordinary physical laws governing any kind of loudspeaker. The transducer and the driven panel, separately and in combination, will have a whole array of electrical and physical qualities which will dictate performance in terms of power handling, distortion, efficiency, bandwidth, peaks and troughs, resonance and standing waves, directivity, etc.

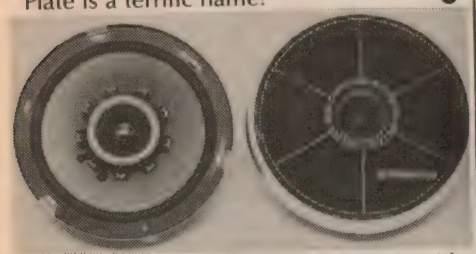
Apart from this, one of the basic problems of all such devices is that low frequency response is limited by the mass of the transducer—or rather its lack of mass. At low frequencies, there is a tendency for the panel to remain stationary—restrained by its own weight and the surrounding air—and for the body of the transducer to vibrate. Very little of the drive is transformed into acoustic output, as a result.

This effect, plus the lack of any kind of baffle or enclosure, and the earlier statement that the small glass panel did not appear to vibrate, adds up to a clear indication that the AudioPlate would have very little output at the lower frequencies.

And that happens to line up with a disarming note in the news item referred to earlier. It says that the Company is tooling up for a $300 system for hifi enthusiasts in which the AudioPlate will replace the tweeter "entirely". The woofer will be retained for the time being, because at very low frequencies "the new device appears to fade a bit".

We'd be absolutely staggered if it didn't!

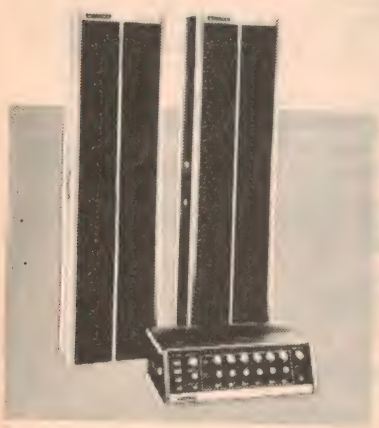
But this much we will admit: AudioPlate is a terrific name!



Intended to offer improved fidelity with higher power to listeners in cars, Pioneer's TS-167 coaxial 2-way loudspeaker employs a 6½in woofer with a separate central tweeter, giving wide frequency response with a power rating of 20 watts. Suitable for mounting on the rear deck or in door panels, the speaker is shown with and without its protective cover, (Pioneer Electronics Aust Pty Ltd, 178-184 Boundary Rd, Braeside, Vic 3195).

Kenny Ball with arm on shoulder of soundman Pickstock outside London Hilton.

The 300,000 mile sound system.



Working with a band that's constantly on the road can give any soundman headaches, so imagine the difficulties facing Ian Pickstock, sound technician for Kenny Ball and His Jazz Men. As the United Kingdom's most widely travelled jazz band, the group wore out its first sophisticated equipment van after 86,000 tortuous miles. But despite the rigors of countless one night stands, Ian's Vocal Master Sound System is still producing true-to-life sound after 300,000 miles on the road! When asked about the Vocal Master's instant adaptability, Ian says, "This system makes an expert out of me—whatever the size and shape of the hall."

Distributed in Australia by
AUDIO ENGINEERS PTY LTD
342 Kent Street
SYDNEY 2000 NSW

SHURE®

AUDIO ENGINEERS (VIC)
2A Hill Street
THORNBURY 3071 VIC

AUDIO ENGINEERS (QLD) PTY LTD
51A Castlemaine Street
MILTON 4064 QLD

ATHOL M. HILL PTY LTD
33-35 Wittenoom Street
EAST PERTH 6000 WA

AE 123/FP

Micro-Seiki DD-40 turntable

The Micro-Seiki DD-40 direct-drive manually controlled turntable is aimed at the well heeled buyer. It is very well finished, and its adjustments can be quickly changed to enable easy swapping of cartridges. Two speeds are provided, and wow and flutter is quoted at 0.028% RMS.

The DD-40 is a direct-drive turntable, and is supplied complete with tone arm, integral base and clear perspex cover. No cartridge is supplied, as it is usual for buyers in this price range to have a selection of cartridges, each mounted in its own headshell and changeable at a moments notice.

Styling and presentaion of the DD-40 is deluxe. A robust diecast chassis is recessed into a heavy timber base, which is beautifully finished in a richly-grained veneer. The timber base has large adjustable shock absorber feet which enable it to be precisely levelled.

Overall dimensions are 497 x 385 x 154 mm (W x H x D) and mass is 11.5 kg. Clearance is required at the rear to allow the perspex cover to swing open. Spring loaded hinges allow the cover to stay open at almost any angle and to close gently. The cover is slightly larger than the timber base and rests, when closed, on two adjustable stops on either side of the base. This avoids the likelihood of marking the timber veneer over a period of use.

Simple controls are provided for turntable operation. A large push-button on the right hand side of the deck starts and stops the motor. A smaller button on the left-hand side selects 33 or 45 rpm speed. Two small knobs either side of the speed selector provide vernier speed adjustment.

Adjacent to the arm fulcrum is the damped cueing lever. Operation is entirely manual—there is no automatic stop of lift-off at end of play.

The platter is a 300mm aluminium alloy diecasting with a mass of 1.5kg. The effective mass of the platter is augmented by the heavy rubber mat. Attached to the platter is a perspex ring carrying stroboscope markings, which are illuminated from the underside by a neon lamp. This is highly decorative even if strictly unnecessary.

A neat feature which should be found on all turntables is the mounting socket for spare headshells. A second arm can be fitted also, using an optional sliding mount which is attached to the righthand side of the turntable base.

We were unable to examine the drive circuitry of the motor, but we were able to determine that the multipole motor carries a slotted disc which is "read" photoelectrically to provide tachometric feedback.

Most tone arms these days apply the stylus pressure by adjusting the arm slightly out of balance. Not so with the DD-40. The arm is balanced in the longitudinal and lateral planes via the usual sliding weights, but the stylus pressure is applied by a spring and wire system which also is used to apply the anti-skating force.

Using the system on the DD-40, it is possible to adjust both the stylus pressure and the anti-skating force for the optimum result while the unit is actually playing a record. To our knowledge, the DD-40 is the first to provide this facility; very elegant. Equally elegant is the quick and easy method of height adjustment of the arm to suit various cartridges. Just release the clamp lever, push the arm boss down, or let it rise gently of its own accord to the correct height and then reset the clamp lever. It's as easy as that. Other tone arms which have height adjustment provide the facility by means of fiddly screws and/or knurled collars.

Other adjustments are equally straightforward and are clearly illustrated in the owner's manual. The arm accepts headshells with the standard EIA locking collar. Bearing friction is very low and the arm is suitable for any high performance cartridge. Tracking force range is 0 to 3 grams.

Effective length of the tonearm, from stylus to pivot, is 237mm and stylus overhang is 15mm. Maximum tracking error is quoted as 1.5 degrees. A spare headshell is supplied with the turntable. Also supplied is a handy gauge for setting the stylus overhang correctly.

A three-core mains flex and three-pin mains plug is fitted to the turntable. RCA phono sockets underneath the base provide for connection of the signal cable, which has moulded plugs at each end. Cable capacitance is 120pF in each channel.

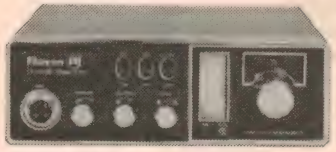
Vertical tracking force calibrations were about 10% low, which is not as good as achieved with the sliding weight system used on most tone arms. Anti-skating force settings appeared to be close to optimum. The motor has adequate torque, and the platter reaches correct speed in less than a ¾ turn. Wow and flutter readings hovered about the 0.1% DIN mark which is equal to the best results we have achieved to date. Rumble is very low.

The Micro-Seiki DD-40 turntable is shown here with its perspex cover detached.

In use, we found the turntable operated smoothly and quietly at all times. It is relatively insensitive to acoustic feedback, and to heavy floor or shelf vibration. The lifting and lowering device is very gentle. It's a unit which is hard to criticise. The price might be a hurdle, though: recommended retail price is $565.00.

Further information on the Micro-Seiki DD-40 can be obtained from high fidelity retailers or the Australian distributors, Photimport Pty Ltd, 69 Nicholson Street, East Brunswick, Victoria, 3057 or their interstate branches. (L.D.S.)

Here are the CB's that catapulted Royce to leadership!



Model 1-612
Gyro-Lock CB Mobile Transceiver

Model 1-590
Mobile CB Transceiver

Model 1-408
6 Channel hand-held CB.

Model 1-614
In dash CB Transceiver
with AM/FM Stereo Radio.

We are the Sole Australian Importers

Intag Marketing Corporation Pty. Limited

42 Grantham St., West Brunswick, Vic. 3055.
Tel. 03 387-3844

SYDNEY BRANCH:
34 Sydenham Rd., Marrickville, N.S.W. 2204.
Tel. 02 516-3500

W.A. DISTRIBUTORS:
Burmac Enterprises Pty. Ltd.
114 Railway Pde., West Perth. Tel. 092 21-8346.

ELECTROCRAFT PTY. LTD.

**106A Hampden Rd.
Artarmon, 2064
Phone 411-2989**

Distributors of Belling Lee, Channel Master, Ecraft, Hills, Hl.Q, Lab Gear, Kingray, Matchmaster. Largest Television range of aerial equipment in Sydney.

TELEVISION AERIALS, DISTRIBUTION AMPLIFIERS, EQUIPMENT AND ACCESSORIES WHOLESALE, TRADE AND RETAIL SUPPLIED.

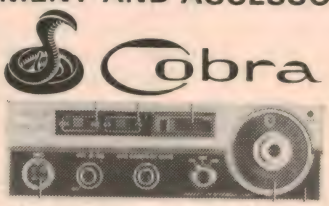
NEW FROM ECRAFT A range of Medium & High gain R.F. DISTRIBUTION Amplifiers, suitable for all TV & FM Radio transmissions within the VHF & UHF Bands 1 to V.

APPLICATION Suitable for small home unit, showroom or household type installations. D16 & D25 amplifiers have good signal to noise ratio. As such this makes them suitable as a booster in semi-fringe or fringe areas.

1.75.D16 16 dB gain **$45.90** 1.75.D25 25 dB gain **$53.55**

All type coaxial cables in stock from 30c per yd. 50 ohm—75 ohm.

HILLS	ANTENNAS	CH's	$
CA16	High gain phased array	Multi	44.36
215/2710	8 EL	Multi	24.42
2010/2710	Airways	Multi	56.26
E.F.C.1	75 ohm for colour	Multi	31.43
E.F.C.2	75 ohm for colour	Multi	41.70
E.F.C.3/24	75 ohm for colour	Multi	60.64
E.F.C.4/24	75 ohm for colour	Multi	76.30
207/45A	.....	4 & 5A	31.47
CHANNEL MASTER			
3110	2 EL Coloray.....	t2 to 11	27.96
3111	6 EL Super Coloray	Multi	41.98
315	2 EL City VEE	0 to 11	15.68
3615A	9 EL Crossfire	Multi	43.64
3614A	13 EL Crossfire	Multi	54.69
3613A	17 EL Crossfire	Multi	68.17
3612A	21 EL Crossfire	Multi	78.54
3610A	24 EL Crossfire	Multi	99.84
3617A	28 EL Crossfire	Multi	125.73
HILLS FM ANTENNAS			
FM1	300 ohm		9.39
FM3	75 ohm		18.27
CHANNEL MASTER FM ANTENNAS			
700 FM 8 EL	300 ohm		19.68
200 FM 2 EL	300 ohm		8.31
MATCHMASTER FM ANTENNAS			
FMG	300 ohm		11.95
FMG/2	300 ohm		18.30
FMG/6	Fringe area 300 ohm		40.93



COBRA 132 $350.00 AM/SSB
Delta Tune. P.A. Extension Speaker Facility. Illuminated Channel Indicator and Metre. R.F. MIC Gain Control. N.B. Switch. Auto Noise Limiter. **Sensitivity:** AM.0.5uV or better, SSB 0.25uV or better. **Selectivity:** 6dB at 4kHz, 50dB at 20kHz, 6dB at 2.2kHz, 60dB at 5kHz. **Audio Output:** 3.5 watts typical.

THE COBRA 26 $120.00
The Cobra 26 is called "The Performance Radio" because professional drivers prefer the 26's top rated features and performance. Just check this list: Switchable noise limiting (ANL), RF gain control, Delta Tune, illuminated Power/S meter, adjustable squelch, PA output, detachable dynamic mike and much more.
The Cobra 26 operates at maximum legal power and critical sensitivities. What it really means to you is more enjoyable use of your CB operation. See for yourself why the Cobra 26 is the standard of comparison in the Citizens Band two-way radio industry.
No matter what the conditions, the Cobra 26 punches through loud and clear.

A big voice in a small package. The Cobra 19M $110.00.
If you've ever heard a Cobra 26, you'll know it's hard to believe all that talk-power is legal. Cobra found the way to make their radios really talk and still obey the rules. Now you can talk just as loud and far with a smaller package. Cobra 19M is thin and narrow enough to mount conveniently in any car, even the latest subcompacts. And the 19M has other features you'd expect from a Cobra, such as a plug-in dynamic mike, external speaker jack, and now, even an illuminated RF/signals metre. The Cobra 19M has the same receiver sensitivity and selectivity as its big brother, Cobra 26. It has an efficient automatic noise limiter too; you'll hear clearly in the heart of heavy traffic. Dimensions: 1½" H x 5⅛" W x 8" D. Power Output: Factory adjusted to 4 watts legal maximum. Modulation 100%. Sensitivity: Less than 1.0uV for 10dB (S+N)/N. Selectivity dB—6dB at 4kHz, 40dB at 20kHz. Image Rejection:—30dB. IF Rejection:—80dB. Audio Output: 2.5 watts into 8 ohms.

CB AERIALS ASIC. 5ft Fibreglass vertical helical whip aerial with base (Guard Mount) complete with 12ft cable & plug. **$26.73.**
5ft Helical home base aerial for mast mounting **$33.**
CB2600 Gutter Clamp aerial complete with lead & plug. **$20.70.**

ALL TYPES OF HARDWARE IN STOCK Wall Brackets, Chimney Mounts, J Brackets, Guy Rings & Guy Wire. Masts from 8ft to 50ft. ETC.

The Australian CB SCENE

IS THE ATDA HAVING ITSELF ON ABOUT UHF?

Reacting to the announcement that CB radio would be legalised in Australia, ATDA—the Australian Telecommunications Development Association—issued the press release reproduced in full below. There's just one small problem: the press release and the Association's stated attitude appears to be based on a misunderstanding of the likely position in regard to UHF CB.

by NEVILLE WILLIAMS

The ATDA has not been alone in jumping to dubious conclusions about CB. No sooner had the announcement been made by the Minister for Posts and Telecommunications, Mr. Eric Robinson, than the airwaves and the "bush telegraph" were running hot with reports from people who "knew" the number of channels that would be used, the allocation of those channels, the attitude to equipment, the method of CB licensing, the fate of amateurs on 27MHz and so on.

All this, and much more from reliable "inside" sources, within mere hours of the announcement.

We did our best to check on some of these reports, including one about a crippling tariff and tax imposition on CB gear, but one thing became abundantly clear: none of the reports were authoritative and none of them could be, because they related to decisions which had not yet been taken!

During the earlier part of this year, the Minister and his Departmental officers had been subjected to a tremendous amount of pressure for and against the legalisation of Citizens Band radio. They had invited reports, received reports and produced one of their own. It remained for the Minister to respond.

In due course the Minister said "yes"; CB radio would be legalised on the 27MHz band, pro tem. However, the long term objective would be to transfer it to an UHF allocation and, to ensure that this came about, new 27MHz equipment would not be approved after a period of 5 years. A licence fee of $20 per year was envisaged.

Having stated this as the Government's broad policy, the Minister simply left it to his Departmental officers to work out all the necessary administrative details and this what they were engaged in during the period following the official announcement. They were examining ideas and submissions, talking to industry representatives and to other affected parties, and trying to work out what would or would not be practical within the broad guidelines defined in the Minister's statement.

Until it was all brought together and reconciled into one set of regulations, nobody—literally nobody—could have known what the final details would be, not even the people charged with doing the job!

Calls to radio inspectors and other officials in the various capitals drew a blank, because they were not party to the decision-making process at that stage.

In due course, a press release from Canberra (circa June 23) set out the broad planning for CB in Australia, but

ATDA WELCOMES UHF CITIZEN BAND RADIO

The Australian Telecommunications Development Association welcomed the Federal Government decision to introduce UHF as the approved licensed Citizen Band radio service in Australia.

Member firms of the Association who manufacture and distribute Citizen Band radio sets said the decision by the Minister for Post and Telecommunications, Mr Robinson, would be a boost for the local industry and would help to combat severe competition from overseas manufacturers in low cost labour countries.

The Minister has indicated that conditions for using CB equipment and licensing procedures would be announced as soon as possible, but indications are that there will be an annual licence fee of $20.00.

Mr Robinson said that CB radio would operate exclusively on the Ultra High Frequency (UHF) from June 1982.

Until then both the UHF and the 27 Megahertz equipment would be licensed, provided it met technical specifications and was operated within regulations approved by the Government.

Potential buyers of the 27 Megahertz equipment or equipment that may not meet the new technical standards should exercise caution in their purchases and be aware that it will be illegal to operate such equipment after June 1982, Mr Robinson said.

The Australian telecommunications manufacturing industry said they were well geared up to manufacture UHF CB radio equipment—in fact the UHF equipment made in Australia has met strict specifications laid down by Telecom Australia and has done so for many years.

They said the advantages of the UHF equipment over the 27 Megahertz equipment were numerous and included:

- The avoidance of interference to emergency services mobile radio equipment, particularly the interference previously caused by CB radio operators talking over the Police, ambulance and fire network;
- The UHF CB equipment would restrict users to a tighter radius: previously CB operators were on a frequency which would allow them to talk to all parts of Australia in favourable weather conditions; and
- The new regulations will overcome the indiscriminate use of CB radio and make it now a publicly controlled and very workable two-way radio service for users.

Australian manufacturers already produce a large range of UHF equipment for commercial usage and are awaiting the full specifications from the Government.

" . . . I thought this transceiver outstanding in functional design and operation . . . "

(Roger Harrison, SSB Transceivers Review, CB Australia magazine Vol 1 No 5, June 1977)

Of the ten SSB CB transceivers reviewed by CB Australia magazine, only two stood out for performance & operability. Here is what the reviewer, Roger Harrison, said about one of them:

" . . . outstanding in functional design & operation . . . the controls had the best 'feel' of all the units reviewed . . . on receptior the audio quality appears particularly 'sharp' giving good, clear sound . . . the handbook is particularly informative . . ."

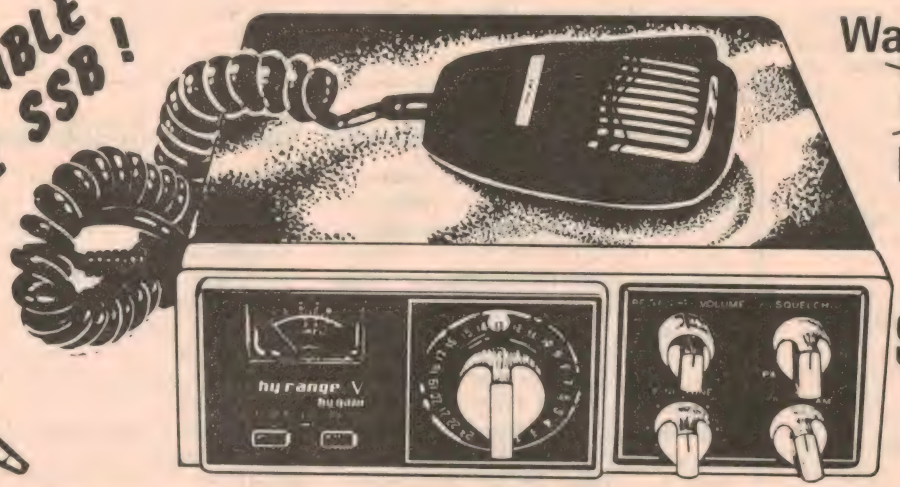
IN FACT, ROGER HARRISON DID NOT HAVE ONE SINGLE POINT OF CRITICISM ON THIS UNIT!

WHICH ONE?

hy-range V BY hy-gain

Dick Smith & dealers are proud to announce a scoop purchase of this incredible transceiver. It is fully licensable and meets FCC specifications. It was selling in Australia for much more — so if you want an outstanding bargain NOW is the time to buy. We have limited stocks — and prices must increase when stocks are exhausted. It really is a tremendous deal for a tremendous rig!

INCREDIBLE VALUE SSB!



Was selling for ~~$310.00~~

Now from Dick Smith & Dealers:

$279.50

Cat. D–1704

NB Yes! This set is fully licensable — you can obtain your license RIGHT NOW from the P&T Dept.

WHITE KNIGHT & TWIN TRUCKERS

Our new 'white knight' top loaded whips are taking the CB world by storm! Fantastic performance with the power coil, has a short stub for precise SWR adjustment. Comes complete with trunk lip or roof mount, co-ax cable with pre-fitted PL-259 plug; all ready to put up and go-o-o! Incredible value at the price!

Cat. D-4452 .. .. **$29.50**

How about twin white knights?

Ideal for all trucks, buses, large cars, etc etc etc! A pair of the above antennas with a pahsing harness to operate them correctly. Kit includes loads of cable and mirror mounts. Just what the truckies want! The mirror mount bases have the standard 3/8", 24 TPI thread. Versatile!

Cat D-4454 ... ... **$49.50**

13.8V SUPPLY

Contrary to popular belief, you CAN run a base CB station, subject to a couple of conditions . . .

And here is the ideal base power supply. It's rated at 13.8V DC, 3A (peak) or 1.5A continuous. Just what a CB requires. Housed in a strong metal case; complete with mains flex & plug. Makes an ideal service aid, too (car radios, tapes, etc).

Cat. M-9540 .. .. **$38.50**

DICK SMITH ELECTRONICS GROUP

VISIT YOUR NEAREST STORE:
SYDNEY – 125 York St, Ph. 29 1126
BANKSTOWN – 361 Hume Hwy. Ph. 709 6600
GORE HILL – 162 Pacific Hwy. Ph. 439 5311
MELBOURNE – 656 Bridge Rd, Richmond. Ph. 42 1614
BRISBANE – 166 Logan Rd, Buranda. Ph. 391 6233
MAIL ORDERS: P.O. Box 747. Crows Nest, N.S.W. 2065.
AND NOW OUR NEW STORE AT PARRAMATTA: 30 GROSE ST – Ph. 683-1133

DSE64EA87

WE HAVE DEALERS ACROSS AUSTRALIA. PHONE YOUR NEAREST STORE FOR THE DEALER CLOSEST TO YOU.

The Australian CB SCENE

it left much detail to be filled in and it also triggered a whole set of complex reactions from the interested public. Almost certainly, there will be further developments between the time this is written and when you get to read it—a most frustrating situation that faces the publisher of any monthly journal!

The initial step—licensing of most equipment currently being used by non-licensed operators clearly has the objective of securing some kind of order out of what is currently chaos. The degree to which this will succeed has yet to be demonstrated, in the light of a widespread reaction that: "I'd rather remain a pirate than pay $20 a year for every CB set!"

Such a decision could, however, have long-term ramifications, because, if existing equipment is not licensed in the initial July-August period, it may be much more difficult to have it licensed thereafter.

That matter aside, three further distinct steps are planned to ensure that the standards of all new 27MHz CB equipment being sold and licensed in Australia is comparable to what now applies in the USA.

While some have deplored the idea of "amnesty" for CB "pirates", the Minister has simply had to concede the enormous number of 27MHz transceivers now in the hands of Australian citizens and the virtual impossibility, at this belated stage, of preventing them from being used. He had very little option but to legalise CB on the 27MHz band as a first step towards evolving means by which it could be regulated to minimise the conflict with other interests.

By proposing an immediate alternative CB allocation on UHF, the clear intention is to encourage migration into that part of the spectrum. Whereas, even now, the 27MHz band is a congested mass of voices and carriers in the major cities, anyone who can take prompt advantage of UHF can look forward to virtually interference-free 2-way communication, at least for some years.

The main hassle, of course, will be to obtain suitable equipment to use on the UHF band. While the "General Mobile Radio Service" in the USA operates on frequencies at 25kHz intervals between 462.550MHz and 467.725MHz, there is no huge reservoir of ready-made transceivers, as there is in the case of 27MHz.

Some time ago, the FCC was considering the option of developing this band for switched channel CB-style operation, along with other options at 220-225MHz and 890-947MHz. As it transpired, the FCC deferred such plans and chose instead to more fully exploit the 27MHz region. It involved more channels, greater use of SSB and a much tighter system of specification and type approval.

According to reports, the technical upgrading of CB transceivers is working out in America and it is inevitable that the FCC initiatives will be reflected in the attitude of Australian authorities to what will or will not be acceptable here.

Reportedly, Australian authorities would dearly have liked to avoid the type approval approach altogether, because it would inevitably impose a new and onerous load on existing Departmental laboratories and facilities. Consideration was given to publishing minimum specifications and relying on marketers not to offer equipment which failed to meet them. If they did so, or offered 27MHz supplements which were clearly outside the published specifications, they would (presumably) have been liable to proceedings under trade practices legislation.

By way of precedent, this kind of dissuasion helped, in the colour television field, to keep ersatz-PAL receivers out of Australia; but the situations are scarcely parallel. Before there was any need or occasion to put the matter to the test ersatz-PAL television receivers had virtually disappeared from the world scene.

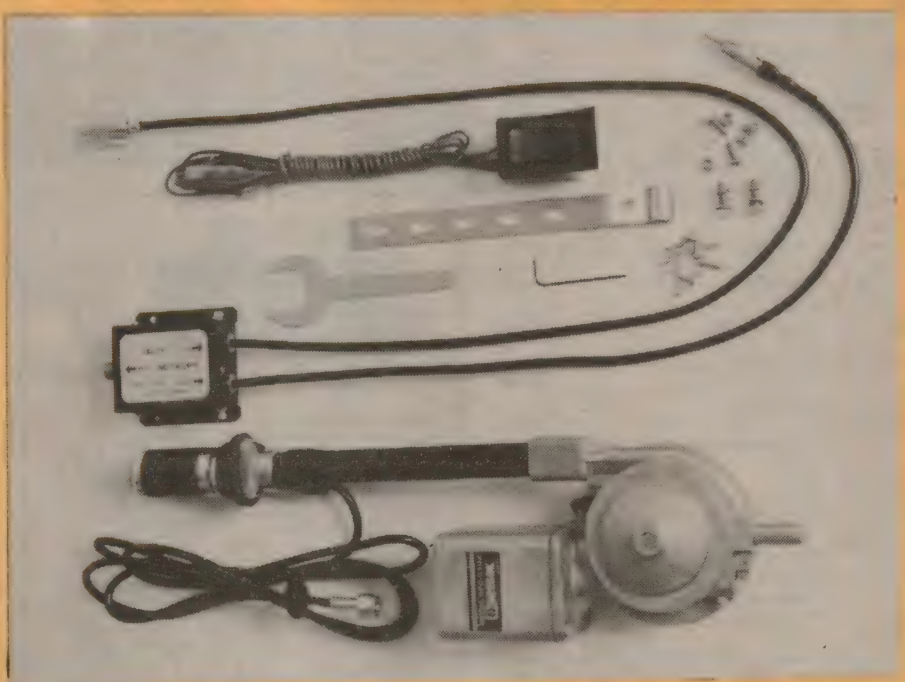
But there are—and will remain—any number of overseas manufacturers and exporters who would be delighted to ship to Australia any CB gear that they thought they could sell—good, bad or indifferent, with or without subterfuge. And, undoubtedly, there would be marketers at this end no less delighted to make a fast buck, if they thought they had a reasonable chance of getting away with it.

Who would initiate legal action, anyway, and who would perform the detailed tests needed to establish that certain equipment did not conform to specifications of the more obscure kind? And would not a supplier who got caught, reasonably be able to plead that he had traded in good faith, having accepted the performance figures of an overseas supplier?

Many established suppliers felt that control of imports and sales could only be effective if it was imposed by the Government in the form of strict type approval. Any other system, with potential loopholes, would encourage sharp practice and force otherwise honest marketers to follow suit, to avoid being disadvantaged.

However imposed, the control of equipment is presently complicated by the fact that licensed radio amateurs have access to the 27MHz band without the constraints which normally apply to CBers. A marketer can—and could—therefore import and sell non type-

POWER DRIVEN RADIO / CB ANTENNA



Providing a stylish and tidy answer to a potentially untidy problem, the NFC-510A power driven automotive antenna can provide facilities for ordinary AM/FM broadcast reception from the car radio, as well as transmit/receive on the 27MHz CB band. Using stainless steel telescopic elements, the assembly requires a 1ft clearance below the 1in mounting hole but extends 43ins and gives a rated VSWR of 1.2 at 50ohms in the CB band. The kit, as pictured, includes the power driven antenna, up/down rocker switch, CB/AM/FM splitter, cables with connectors ready fitted and sundry items of hardware. Fitting instructions appear on the back of the box. (From Dick Smith Electronics, cat. no. D-4419, price $59.50)

VICOM

Head Office & Mail orders –
139 AUBURN RD. AUBURN VIC. 3123. Ph (03) 82.5398
(03) 813.2355

VICOM gear also available from a network of dealers throughout Australia. Dealer enquiries welcome.

Prices and specifications subject to change without notice.

Direction: Russell J. Kelly
Peter D. Williams

Because **VICOM** *specialise in communications equipment – Military, commercial, marine and hobby – you get only quality gear serviced by the experts. Technical support and advise is available together with a repair service for transceivers. Come and receive some of that friendly personalised service for which VICOM has become famous!*

HAM ANTENNAS ACCESSORIES

MOBILE ANTENNAS

MARK HELICAL WHIPS (6 ft.)

HW40	40 metres	$31	HW20	20 metres	$31
HW80	80 metres	$31	LDS spring		$13
HWM–1 base assembly		$18			

HUSTLER RESONATORS

RM80	80 metres	$26	RM20	20 metres	$22
RM40	40 metres	$25	RM15	15 metres	$22
RM10	10 metres	$22	RM11	11 metres	$19
RSS–2 spring base		$11.50			
BM–1 bumper mount kit		$19			

VHF/UHF BEAM ANTENNAS

JAYBEAM

5Y/2m 5el 2m 7.8dBd gain	$26
8Y/2m 8el 2m 9.5dBd gain	$30
10Y/2m 10el 2m 11.4dBd gain	$57
10XY/2m crossed yagi 11.3dBd	$66
D8/70 twin 8el 12.3dBd gain	$46
PBM18/70 18el 70cm 14.9dBd	$57
MBM8870 88el 70cm 18.5dBd	$66
MBM4870 48el 70cm 15.7dBd	$55

ASAHI

AS210AN 10el 2m 14.5dB	$49
AS210BN twin 10el 18dB	$119

BASE & MOBILE

ARX–2 Ringo Ranger for 2m	$45
Lindenow 5/8 mobile whip	$26

PARABOLIC DISH ANTENNA

For 430 and 1296MHz	$349

NOISE BRIDGES

TE7–01 up to 100MHz	$38
TE7–02 up to 300MHz	$48

ANTENNA COUPLERS

CL66 HF incl coax switch	$139
CL65 HF	$128
CL99 for 2 metres	$59
CSW216 incl swr/pwr meter	$210

SWR/PWR METERS

VC2 3–150MHz twin meters	$36
SWR200 professional Oskerblock	$59
SW410 VHF/UHF 140–500MHz	$99

ROTATORS

Heavy Duty ART3000C with control box	$189
Medium Duty CD44 with control box	$192
Light Duty AR22XL with control box	$99

MORSE KEYS

Economy model, HK708	$17
Operator model, HK706	$19
Deluxe Model, HK702	$32
Electronic keyer with memory	$149

QM70 PRODUCTS

2 metre linear amplifier, 70w pep	$119
28/144 SCORPION transverter	$225
432/28 Converter	$50
144/28 Converter	$45
1296/28 Converter	$60

SPEECH COMPRESSORS

MC33A with compression level meter	$65
MC22 as above without meter	$54

VHF HANDBOOK FOR RADIO AMATEURS: Includes information on FM theory, design, equipment, moon reflection and how to build converters and transceivers for VHF $9 + P & P

EA LOG BOOK: Packed with information, codes, frequencies for radio & T.V., FM standards, call areas etc. $2.95 + P & P

KENWOOD
Transceiver
TS-820
160 thru 10M
$960

KENWOOD

SOLID STATE FET-VOMs

Model 150 Solid State FET VOM
Super sensitivity makes it suitable for any application in the field or on the bench.

- *11 megohm input resistance on all dc volt ranges.
- *1 megohm input resistance on all ac volt ranges.
- * temperature compensated for high accuracy.
- * built-in overload protection.

DC volts: 7 ranges, 0.25 thru 1000 volts
AV volts: 4 ranges, 2.5 thru 1000 volts
DC amps: 5 ranges, 0.025 thru 250mA
Resistance: 5 ranges to 5000megohms
Decibels: 4 ranges
Complete with comprehensive instructions, test leads and batteries.

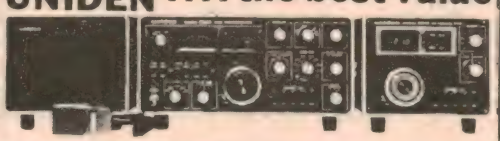
$57

20,000 ohms/volt General Purpose
Model TP-5SN
Accurate and dependable, 6 dc ranges, 5 ac ranges, 4 current ranges, 4 resistance ranges, capacitance and decibel ranges also. Price of $29 includes instructions and test leads.

DELUXE $29

DELUXE MIRROR SCALE MODEL 200
20,000 ohms/volt on 6 dc volt ranges.
10,000 ohms/volt on 5 ac volt ranges.
Readings for capacity, resistance, decibels. An advanced multimeter for the professional, serious hobbyist or for the school lab. Price of $29 is a real bargain for this quality instrument! Includes comprehensive instructions and test leads.

UNIDEN .... the best value



The fabulous **UNIDEN 2020** p11 transceiver offers separate usb, lsb and cw 8-pole filters as **STANDARD** and 6146Bs in the final with screen grid voltage stabilisation for minimum distortion products. Features pcbs and even the front panel can be swung out for easy servicing! A comprehensive range of spare parts is available together with back-up service support. Overseas this rig sells for at least $65 more than the FT101E! Compare the features of the UNIDEN 2020 with other HF transceivers and you'll quickly be convinced that it offers the best value! Price $772, external VFO $145, speaker, $46.

ICOM

ICOM
Transceiver
2M FM
IC 22S
$269

IT'S CRYSTAL CLEAR!
The **IC22S** from **VICOM** is a p11 synthesised rig with programmable ROM for any frequency multiple of 25KHz from 146 thru 148MHz. Simplex, duplex or duplex reverse is achieved by a flick of a switch on the front panel. This fabulous new rig features ceramic discriminator, IDC, electronic tx/rx relay, full swr protection and VICOM 90 day warranty. Circuitry includes 34 transistors, 7 FET, 13 ICs, and up to 128 diodes. Receiver sensitivity better than 0.4uV for 20dB quieting. Your new IC22S comes complete with mic, mobile mounting bracket, plugs, cables, spare diodes and English instruction manual. Programmable matrix is pre-wired for R1–8, 40, 50, 51. A real bargain at $269 plus freight and insurance.

The TS820S from **VICOM** is the rig that is the talk of the Ham Bands. Too many built-in features to list here! What a rig and only **$960** complete with digital display! Many accessories available to increase your operating pleasure and station versatility.

OPTIONS AND ACCESSORIES

VFO820 external VFO for TX820	$140
DS–1 dc power supply for TS820	$70

OTHER TRANSCEIVERS

TS700A 2m all-mode	$630
TR2200A 2m fm portable	$189
TR3200 70cm fm mobile	$299

FOR THE TECHNICIAN

Model 117 FET PROFESSIONAL METER
Designed for the professional, the FET high input resistance ensures voltage measurement without effecting the circuit operation. Includes 7 dc ranges (to 1200v), 4 ac ranges (to 300v), 3 dc current ranges, 4 resistance ranges (to 2000meg) and 4 decibel ranges. Price **$52** includes test leads and instructions.

SWR $36

The popular **VICOM VC2** swr and power meter is specially designed for the serious communicator looking for accurate readings. The bridge operates from 3 thru 150MHz with power measurement either 12 or 120 watts. Will handle up to 1000 watts. Individually calibrated power chart for all Australian Amateur bands and 27MHz CB. A real bargain at this price!

OSKERBLOCK PROFESSIONAL SWR/PWR METER
The professional bridge using thru-line principle covers 3 to 200MHz with dual impedance 52 and 75 ohms. Each instrument individually calibrated and covers four power ranges: 2/20/200/2000 watts.

Standard model SWR200	$69 + P&P
Deluxe model SWR200B	$79 + P&P

CB ANTENNAS

BASE LOADED WHIP
Model M1 quality base loaded mobile whip, 40.5 inches, 50 ohm impedance, vswr less than 1.5. Includes roof mount and optional boot lid mount, spring and coax with PL259 plug. **$19.90** + P&P

27MHz MARINE WHIP
Model HW-11-6M requires no ground plane and can be operated on fibreglass, wood surface or on mast. Comes complete with matcher coax, PL259 plug. $65 + P&P

HELICAL WHIPS
American designed and made, covered in tough plastic, this (top loaded) helical is designed to give a perfect 52 ohm match.

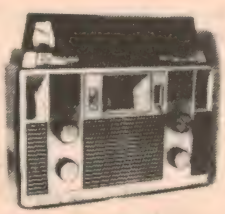
Model HW-11S-6 6ft model	$22 + P&P
Model HW-11S-4 4ft model	$22 + P&P

Locally made HELICAL – 5ft –

excluding base	$19 + P&P
base for above	$6 + P&P

RINGO
Model V1 half-wave ground plane, gain 3.75dB, overall length 5.5m, mounting on mast tubing up to 1½" diameter. **$49** + P&P.

GROUND PLANE
27MHz ¼ wave ground plane, superb quality, solid 108 inch heat treated radials and radiator. Radials droop for 50 ohm match. Complete with S0239 socket. **$35** + P&P



SWLs

BARLOW WADLEY
The famous portable Barlow Wadley Communications Receiver with crystal controlled reception of am/lsb/usb/cw

Standard model	$319
With FM	$339

ANTENNAS
Listener-1 "V" type covers 3.30MHz with special trap for DX reception $22
Listener-3 long range wire dipole antenna 3.30MHz complete with balun, feed wax, VHF plug, insulators. Ideal for the serious SWL $49

The Australian CB SCENE

approved or add-on equipment on the basis that it is "for amateurs". Once in the country, there is no sure way of preventing CBers from getting hold of it and using it illegally.

If the Government is to block this ploy, it would seem to have little option but to adopt one of two courses:

- Forbid amateurs to operate as such on the 27MHz band. They would have to take out a CB licence, hopefully without extra fee, and operate as CBers, using only approved equipment.
- Continue to operate as amateurs but using only type approved CB equipment on 27MHz to forestall the "this is for amateurs" excuse.

The latter option might require amendment to the regulations to impose these special limits on 27MHz operation, and a further amendent if the amateurs were to be allowed to converse with CBers sharing the same band. Changes of this nature would not come easily and the chances of amateurs being allowed to stay on 27MHz would appear to be dubious. But having in mind the congestion on 27MHz, it could be a blessing in disguise if novice amateurs were to be given a segment on 28MHz instead.

Over and above the 27MHz equipment already in the hands of amateurs and would-be CBers, a large amount is in the shops and in transit, and the plan is that marketers will be given until the end of the year to dispose of it. After that, all new stock will necessarily have to meet specifications as laid down by the P&T Department, probably an 18-channel version of current FCC specs.

This position will hold until June 1982, when the sale of new 27MHz equipment will be halted.

SO TO THE ATDA

And this is where the ATDA appears to have jumped to a most unlikely conclusion when it says: "Mr Robinson said that CB radio would operate *exclusively* on the Ultra High Frequency (UHF) from June 1982."

Taken on its face value, this would mean that, on the night of May 31, 1982, a huge number of imported 27MHz CB transceivers will be operating normally and legally. On the morning of June 1 they will be illegal, verboten; pieces of surplus electronic junk, hopefully needing to be replaced by thousands of new Australian-made UHF transceivers.

Whatever inferences might be drawn from the Minister's brief announcement, the foregoing expectations are certainly not in line with the thinking of his Departmental officers. They are sufficiently realistic to know that, if they could not prevent large numbers of people from operating illegally in June 1977, they will have Buckley's chance of preventing a far greater number from doing so in June 1982!

Logically, the pattern will follow what has already been set for the boating and flying doctor services, in their progressive conversion to SSB working. There will be a cut-off date for the sale and licencing of new but obsolescent equipment—in this case June 1982—but existing equipment will continue to be re-licensed until it wears out, or until some as yet remote date when it is ultimately banned. Expectation in the Department is that, with 27MHz equipment being sold and licensed until June 1982, it will still be in use during at least the next 5 years.

In the face of this almost certain situation, people who want it will have little hesitation in buying 27MHz equipment now or within the next few years, provided it meets the then current specifications and is capable of being licensed. If there is any disincentive, it will be from a conviction that the channels are so congested, in the major cities at least, that 27MHz CB is hardly worth having!

For people who need 2-way communication for specific purposes, a couple of UHF units might thus be a far better proposition—if they can be obtained!

And this leads to a second point which seems to be a tacit but unspoken assumption in the ATDA release: that local manufacturers will have a unique opportunity to supply the demand for UHF transceivers, based on their access to the market and their familiarity with this part of the spectrum.

The idea is reinforced by speculation that Australia could establish a pattern for UHF CB and become a supplier to other countries wishing to adopt the same standard.

It would certainly appear that Australia is in a position to set a lead with switched channel CB transceivers operating around 470MHz. Whether other countries are free to adopt the Australian standard is another matter. One of the things that arose out of Departmental consideration of the UHF spectrum is the number of allocations, provisional allocations and other inhibitions which already affect this part of the spectrum—differently in different countries!

If a few limited markets could be opened up, that would be just about ideal for Australian manufacturers. However, if the potential market for Australian type UHF CB transceivers began to look too promising, member companies of the ATDA (to use their time-worn phrase) could find themselves up against overseas competition in UHF equipment, just as now of 27MHz.

In no sense is this meant as an anti-ATDA sentiment; Australian electronics manufacturers desperately need as many outlets as they can find for their domestic products. However, it would be quite

The Australian CB SCENE

unrealistic to think in terms of beautifully made Australian transceivers at $700 apiece, when the up-market CB limit is less than half that figure.

The all too familiar problem of the Australian electronics industry, is its inability to compete pricewise, with imports, in the consumer market.

If local manufacturers are to turn the new CB allocations into any kind of a bonanza, they will somehow have to learn to manufacture transceivers down to a price, while still meeting the requisite standards.

One other aspect of CB licensing in Australia is very much in the melting pot, as we write this article.

Practice to date has been to license the equipment used by communication systems, leaving the owners or administrators of the systems to determine who should responsibly operate that equipment.

With amateurs, however, the operators themselves are licensed and they are free to use whatever equipment they wish, provided it meets recognised technical requirements.

With CB, which is at the one time a technical and consumer facility, the authorities see the need for control over both the equipment (the technical side) and the user (the consumer aspect). There is a clear parallel in the case of motoring, where control is exercised over both vehicle and driver(s), and discipline can be exercised in either area, as appropriate. But the Wireless Telegraphy act, as it stands at present, is as about as remote as it could be from the needs of Citizens Band radio, and there may be quite a gulf, for the time being, between what the authorities will do in regard to licensing, and what they would like to do.

Accordingly, CB licensing for the time being is on the basis of equipment only, with a separate licence being required for each individual transceiver—exactly as for companies, associations and public utilities operating a fleet of vehicles.

However, whereas a number of licence fees is no great hassle for a company or a public utility, they would be a slug for private individuals who have equipped themselves and their families with multiple CB units. Such people face a number of not very happy options: pay the annual licence fees which may be a significant proportion of the value of some units; sell the sets, preferably before the end of August; or operate them illegally and risk prosecution.

TASC TM-1100 FROM C. HUPPERT & CO.

Currently being offered by C. Huppert & Co. is this model TM-1100 CB transceiver manufactured by the TASC Corporation Ltd. Employing 1 integrated circuit, 16 transistors and 13 diodes, it is a 23-channel AM-only unit, designed primarily for under-dash mounting in a motor vehicle, involving the usual inverted cradle. Transmitter specifications are: RF power output 4 watts; frequency tolerance ± 0.0035%; spurious rejection -56dB; current drain 1.5A. In receiving mode it offers good sensitivity, adjacent channel rejection of 46dB at ± 10kHz, a current drain of not more than 0.3A and a power output of up to 3 watts. A double-change super-heterodyne circuit is employed with the IF at 10.6MHz and 455kHz. The TASC TM-1100 is imported and distributed by C. Huppert & Co. (Vic.) Pty. Ltd., of 175 Grattan St., Carlton, Vic. Phone (03) 347 7166. Retail price quoted is $130 and this includes a 90-day warranty. Spare parts and service back-up is ensured.

CB Prices Slashed

get on air with REALISTIC

your choice **49.95** ea

SAVE $40

21-141

P.M.G. APPROVED for use on Maritime Safety Frequency

SAVE $20

21-133

Compact, Power-packed CB Mobile

Realistic TRC-11. Packs 6 channels, 5 watts input power and superior performance into a super compact set that's small enough to fit anywhere. Complete with dynamic mike, mounting bracket and hardware. Comes with crystals for Australian Channel 6 (USA Channel 11) **...now only 49.95**

Our Normal retail price
~~89.95~~
each

3-Channel, 3 Watt Input Realistic Transceiver

Our normal retail price ~~69.95~~ **each**

Realistic TRC-99C. A professional in every way except price. Meter checks battery and output levels. Built-in ANL with squelch control. Jacks for external speaker, mike, antenna and DC power. Includes crystals for one channel and 10 "AA" cells **...now only 49.95 ea**

At time of printing it had been announced licencing of CB transceivers will commence July 1, 1977. It was also stated that channels 1 to 4,10,21 and 23 are prohibited from use on current USA 23 channel sets.

Even More Realistic CB Values

23 Channel Mobile
99.95 21-168

Realistic TRC-68. Our most economical full 23 channel 2-way radio comes with all crystals, lighted channel selector, mounting brackets and instructions. 4 watts RF power output. Plug in mike, squelch and ANL.

6 Channel 5 Watt Input
89.95 21-184 **ea**

Realistic TRC-200. Range boost side panels couple your body to antenna for extended range. Battery/RF power meter. Squelch, separate speaker and electret condenser mike. Jacks for a full array of accessories. With crystals for one channel and 8 "A" cells.

TANDY ELECTRONICS
THE WORLD WIDE SUPERMARKET OF SOUND

TC877

The Australian
CB SCENE

Royce transceiver/car radio 1-614

Designed to mount behind the fascia of an ordinary car, the Royce model 1-614 is another unit designed to combine the facilities of a complete 23-channel AM transceiver with a modern car radio—AM broadcast and FM/stereo.

When mounted behind the fascia as intended, the 1-614 would look much like any other AM/FM car radio, with concentric chromium-plated knobs either side of a tuning dial and a row of push-buttons. While the microphone plugs in from the front, it disconnects easily and could be stowed in the glove box when not actually in use.

Conforming to the look-alike theme, the various markings on the knobs and panel are functional only, with no attempt at display.

By styling and installing a transceiver in this fashion, it is less obvious to would-be thieves and, even if it is noticed, a unit installed behind the dash is much less accessible than one slung below it. In the near future, the importers plan to have available a powered antenna and splitter which will obviate the necessity for separate external antennas.

Looking at the unit, the push-button at the left, placed suggestively alongside the microphone socket, provides for CB/radio changeover.

When CB is selected, the large knob—again on the left — selects the required channel, while the smaller one concentric with it is the volume control for all functions. A second push-button provides an automatic noise limiting function, another changes the RF "gain" (DX/Lo), while the larger right-hand knob, graduated 0-10 controls the adjustable squelch.

Incoming signal strength is indicated on an S-meter of comparatively generous proportions, while the sound as heard is modified by a slide type tone control and by a left/right balance slider. In this connection, the 1-614 has no in-built loudspeaker but is intended to feed into two or four speakers fitted in the passenger compartment: left/right and/or front/rear.

A push-to-talk lever on the side of the microphone switches the transceiver to "Transmit", lights the appropriate indicator and converts the meter to indicate relative RF output power.

Manufacturer's specifications for the transceiver conform to normal expectations for such a unit:

Receiver: sensitivity, 0.5uV for 10dB S/N ratio; selectivity 5kHz at 6dB; squelch range 0.7 to 100uV; audio output 4W at 6% distortion; audio response 500 to 3000Hz; I.F. 10.695MHz and 455kHz.

Transmitter: RF output 4W; modulation capacity more than 80%; harmonic suppression more than 50dB.

Following normal practice with 27MHz units, we simply set it up in a known suburban location, connected it to a known resonant antenna, and used it to talk to other amateurs in place of the regular "rig". Performance on "receive" was entirely normal and the ANL provision worked well in the presence of impulse noise. Measured RF power output into a dummy load indicated full rated power output and reception reports from known amateurs produced the expected number of S points and a clean bill of health for the modulation.

The one point of note is that the 1-614 has no delta tune provision, explained in the manual as being unnecessary because the design uses a "gyrolock" synthesiser to maintain very close control of frequency. It still means that the 1-614 cannot be nudged towards a slightly off-frequency carrier but, in practice, the provision is not nearly as important in an AM-only transceiver as it is with one which has to cope also with SSB.

Used in the "radio" mode to receive normal AM and FM broadcast signals, the 1-614 will obviously be less convenient for a driver than a unit designed purely for radio reception—if only because it lacks the usual station-select push buttons. In addition, as seems common with combination units, the rather complex drive train to the inductive tuning unit and the dial pointer imparts a certain amount of springiness to the tuning action.

Sensitivity on AM appears to be excellent and the rated selectivity (7kHz for 6dB down) a reasonable compromise between station-to-station performance and sideband cutting. There were some heterodyne whistles when the receiver was used at night with a household indoor antenna but this should not be a problem when installed in a car, using a car whip and with the input circuit peaked.

On FM, the same indicator lamp which shows CB "Transmit" is used to indicate a stereo transmission. The block diagram of the receiver shows an AFC (automatic frequency control) link, but there is no provision for the user to disable it, and prevent the receiver preferring strong signals to adjacent weak ones. This fact, coupled with the fairly sharp FM tuning characteristic, would suggest that the designers have settled for a limited AFC characteristic—enough to lock the wanted signal; not enough to dictate the provision of an AFC disable switch.

The 1-614 comes complete with a well produced 24-page owner's manual and a copy of the circuit diagram. Noted prominently in the manual is the fact that the unit can be used in vehicles with either positive or negative ground, and in vehicles with either two or four speakers installed.

Australian distributors for the Royce 1-614 are the Intag Marketing Corporation Pty Ltd, of 42 Grantham St, West Brunswick Vic 3055; or at 34 Sydenham Rd, Marrickville, NSW 2204. Recommended retail price at the time of writing was quoted as $198. (W.N.W.)

The Australian

CB SCENE

PROVISIONAL CB REGULATIONS SUMMARISED

The following is a summary of Australian CB regulations as we understand them at the time this page was typeset, in early July. It is based mainly on information released directly from Parliament House, Canberra.

A preamble to the most recent Ministerial statement makes it clear that the initiation of a Citizen Band Radio Service on 27MHz is seen only as an interim measure, accommodating to current pressures, and currently available equipment, within the structure of the existing Wireless Telegraphy Act.

Progressive steps will be taken to tighten technical standards, set up a more appropriate licensing system and, in due course, to confine the entire CB service to the UHF spectrum. Present regulations should be viewed in this light.

FREQUENCIES: Licences will be issued for operation in the UHF spectrum near 470MHz (precise channels yet to be nominated) or in the 27MHz band. A condition of any licence issued for 27MHz is that the equipment may be operated only on frequencies as designated in the accompanying table. With existing American style CB equipment this excludes the USA channels 1, 2, 3, 4, 10, 21, and 23. (The regulations do not, as yet, specify particular use for particular channels—Ed.)

INITIAL LICENCE PERIOD: People in possession of HF CB equipment may have it licensed in the period July 1 to August 31, 1977, provided the equipment is not fitted with more than 23 channels and does not have an RF power output in excess of 5W DSB or 12W PEP SSB. Licences as above are renewable "for the term of the service". It is specifically stated that 40-channel equipment will not be licensed.

SECOND LICENCE PERIOD: From September 1 to December 31, 1977, only equipment fitted for up to 23 channels and meeting the USA 1976 technical standards will be licensed. If desired, owners of such equipment may have it modified by qualified technicians to incorporate the 2 channels unique to Australia, provided the prohibited channels are eliminated at the same time.

THIRD LICENCE PERIOD:. From January 1, 1978, only equipment which meets the new Australian standards for HF CB will be licensed. (Presumably these will be similar to the USA 1977 standards but limited to the 18 Australian channel frequencies—Ed.)

AUST/US CB CHANNELS

AUST. CHN.	FREQUENCY MHz	USA CHN.
1	27.015	5
2	27.025	6
3	27.035	7
4	27.055	8
5	27.065	9
6	27.085	11
7	27.095	—
8	27.105	12
9	27.115	13
10	27.125	14
11	27.135	15
12	27.155	16
13	27.165	17
14	27.175	18
15	27.185	19
16	27.195	—
17	27.205	20
18	27.225	22

FOURTH LICENCE PERIOD: After June 1979, SSB (single sideband) facility will be mandatory as a licence condition for all new HF CB equipment.

FIFTH LICENCE PERIOD: After June 1982 no more new VHF CB equipment will be licensed. All new CB equipment from July 1 1982 will have to operate exclusively in the UHF CB allocation. (It is expected that licences on existing 27MHz CB equipment will be renewed during the life of the equipment, or until a cut-off date well beyond 1982—Ed.)

UHF ALLOCATION: There will be 40 channels, each 25kHz wide, occupying 1 MHz of spectrum space near 470MHz.

LICENCE FEE: $20 per unit, renewable annually. (Many claim that the fee is prohibitive, particularly for CBers who possess more than one unit; that, if it is not reduced, it will simply perpetuate "pirate" operation—Ed.)

MOBILE, FIXED STATIONS: The HF CB service is envisaged in the regulations as being primarily a mobile communication service, with only transitory potential interference into other electronic equipment. Where a licence is sought for a fixed location, the applicant will need to satisfy strict requirements in regard to potential interference in neighbourhood electronic equipment.

SUPPLEMENTARY EQUIPMENT: The use of linear amplifiers and/or high gain antennas is strictly prohibited.

LICENSING CENTRES: Copies of the licensing brochure RB-14 and the licence application form RB-13 are available from the Superintendent in each state of the Postal and Telecommunications Department Radio Frequency Management Division; or from District radio inspectors in state zones; or from: The Assistant Secretary, 502 Bourke St, Melbourne, 3000. Telephone (03) 802 0151.

AGE OF LICENSEE: Where the applicant is under the age of 18 years, the licence application must be countersigned by a parent or guardian, accepting responsibility for correct operation of the equipment.

From the WORLD'S LARGEST MANUFACTURER OF C.B. RADIOS

Kraco

SINGLE SIDE BAND KCB 2340 23 CHANNEL AM/SSB MOBILE

- Advanced Frequency Synthesized Circuitry Assuring Stable, Reliable Operation
- AM / USB / LSB Mode Selector
- Switchable ANL (Automatic Noise Limiter)
- Noise Blanking (NB) Circuitry to Reduce Impulse Noises
- Switchable PA (Public Address) System
- Continuously Variable Squelch Control for Quiet Stand By Operation
- RF Gain Control for Better Reception
- Clarifier Control Allows Tuning to Slightly Off Frequency Channels
- Large, Illuminated Signal Strength and RF Output Power Meter
- Illuminated 23 Channel Selector
- Full Volume Control
- Press to Talk Dynamic Microphone.

Kraco

SINGLE SIDE BAND KB 2355 23 CHANNEL AM/SSB MOBILE BASE STATION 12 VOLT / 240 VOLT.

- AC or DC powered for base station or mobile use (DC—Negative Ground)
- Advanced frequency synthesizing circuitry assuring stable, reliable operation
- AM / USB / LSB mode selector
- Switchable ANL (Automatic Noise Limiter)
- Noise Blanking (NB) circuitry to reduce impulse noises
- Switchable PA (Public Address) system
- Continuously variable Squelch Control for quiet stand-by operation
- Separate Transmit and Receive indicator lamps
- RF Gain Control for better reception
- Clarifier control allows tuning to slightly off frequency channels
- Calibration control for SWR measurements
- Large, illuminated Signal Strength Meter
- Large, illuminated RF / SWR meter for RF output power and Standing Wave Ratio of antenna system
- Illuminated 23 Channel selector
- Volume control
- Headphone Jack
- Press-To-Talk Dynamic Microphone
- High reception sensitivity
- Built-in Front Mounted Speaker.

DISTRIBUTED BY

Radio Parts Group

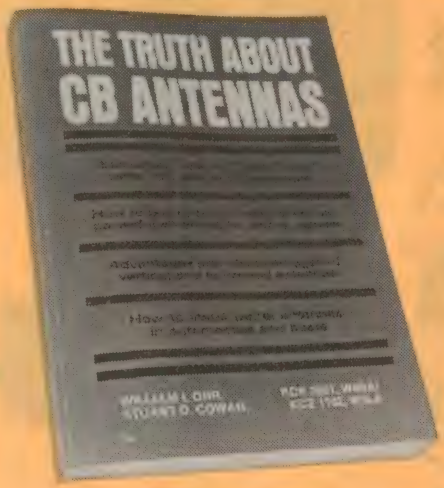
VICTORIA'S C.B. CENTER

AFTER HOURS ORDERS TELEPHONE 328-2224

Registered Office: 562 Spencer Street, West Melbourne, 3003.
Telephone: 328-1251 (7 lines) 329-7888 (7 lines) Telex: 32980 Telegrams: "Swanrad"
Southern Depot: 1103 Dandenong Road, East Malvern, Telephone: 211-8122
Postal Address: P.O. Box 124, North Melbourne, 3051.

The Australian CB SCENE

THE TRUTH ABOUT CB ANTENNAS by William I. Orr and Stuart D. Cowan. published 1971 by Radio Publications Inc, Wilton, Conn, USA. Stiff paper covers, 240pp, 205mm x 138mm, illustrated by photographs and diagrams. Price in Australia $8.50.



While the date on this book is 1971, basic principles don't change and the information is no less valid in Australia in 1977.

The heading on Chapter 1 gives a clue to the Authors' approach to their subject: "Sugar Coated Antenna Fundamentals (What You Don't Know Will Hurt You)". All the chapter headings tend to reflect this informality and are reinforced by occasional pictures, included mainly for a giggle.

But the informal approach is, indeed, only a sugar coating for a lot of valuable information about antennas, related mainly to 27MHz CB operation, but true also in the broad principles involved.

I won't attempt to list all those whimsical chapter headings (eighteen in number) but the subject matter covered includes the history and basics of radiation, radio waves, intercepting signals, resonant antennas, gain type antennas, false claims and the truth, coaxial cables, SWR meters, automotive mobile antennas, marine antenna installations, antennas you can build (an interesting section), antenna roundup, glossary and graduating to the amateur operator ranks.

The Authors make the point in the preface that the performance of a CB transceiver is largely measured by the effectiveness of the antenna installation and this would almost certainly be true. It is not unreasonable, then, to suggest that up and coming CB operators should invest in this most useful book and try to absorb what it has to say, sugar coating and all. Our specimen copy came from Dick Smith Electronics Pty Ltd. (W.N.W.)

For portable radios, cassette players &c:

A UNIVERSAL LOUDSPEAKER SYSTEM

E.A. staff member Danny Hooper contemplates the kit before actually assembling it. Face-up on the panel is the Rola C8MX driver while the preferred—and more expensive—Vanco SR-8MM is still in its box. See text for our comments about the choice of drivers.

Described in this article is a universal loudspeaker system, well suited for connection to a portable radio, a portable tape recorder, a home movie projector, or to a stereo system as an extension outlet. Made up from a kit, it does not call for any special skill or facilities but boasts a thoroughly professional appearance, when completed.

by NEVILLE WILLIAMS

What do we mean by a universal or general-purpose loudspeaker system and how would it differ from one that might be labelled "high fidelity"?

A good question.

While the term "high fidelity" (or "hifi") is applied quite loosely to very ordinary loudspeakers, it more correctly signifies that special attention has been paid, in the design of the system, towards achieving a wide and level frequency response, a minimum of distortion and sufficient power handling capability to provide a generous level of sound, without acoustic overload. It is for these reasons that the design of a high fidelity system involves the careful choice of driver(s), careful consideration of how they mate with the enclosure, and so on.

This is logically reflected in the end result—and usually in the price!

By a "universal" or "general purpose" system, we envisage something that is less pretentious in its aims, which offers somewhat greater latitude in the choice of the (usually single) driver and which costs significantly less. At the same time, the sound output and quality should still be reasonably good and certainly a marked improvement on what is available from the in-built speaker in the average portable radio, cassette player, etc.

The fact is that, while such small in-built speakers do a remarkable job for the size, they lack sensitivity, and they lack any semblance of bass and upper treble response. The same drive signal fed to a larger, reasonably baffled loudspeaker can sound quite dramatically better.

A "larger" speaker may well mean anything from about a 5-inch type upwards, and here it may be helpful to lay to rest one particular long-standing misapprehension: A 5-inch speaker is not normally "harder to drive" than a 3-inch, nor is an 8-inch harder to drive than a 5-inch, and so on. The thing that counts is the sensitivity of a speaker, or how much sound it will produce for a given amount of electrical drive. As often as not, a larger speaker will prove to be more sensitive than a smaller one and, in a sense, will be easier to drive. Certainly, for a given amount of power from the output stage, it will produce a louder sound.

For a general-purpose extension system, a logical choice for the driver is a twin-cone wide-range speaker of nominal 8-inch (200mm) diameter, as commonly used for TV sets and stereograms. Such speakers normally offer a fairly wide frequency response and adequate power handling capacity, as well as being reasonably sensitive. At the same time, they are not too cumbersome, either inherently or in terms of the enclosure they require.

Having been very widely used in the past, 8-inch twin-cone speakers feature in virtually every manufacturer's catalog—and in a great many clearance sales as well. They range from relatively unpretentious and inexpensive models to quite advanced designs which may warrant the description "high fidelity" in both performance and price. It is for individuals to decide how much they're prepared to spend or how hard they're prepared to chase possible bargains.

The most useful impedance to go for, these days, is 8 ohms, being the figure most commonly specified for solid-state amplifiers. 4 ohms will be okay for some equipment but is below the recommended minimum load for many units. 16 ohms is a safe value but may result in a somewhat lower effective sensitivity than an 8-ohm equivalent, when used with equipment requiring an 8-ohm load.

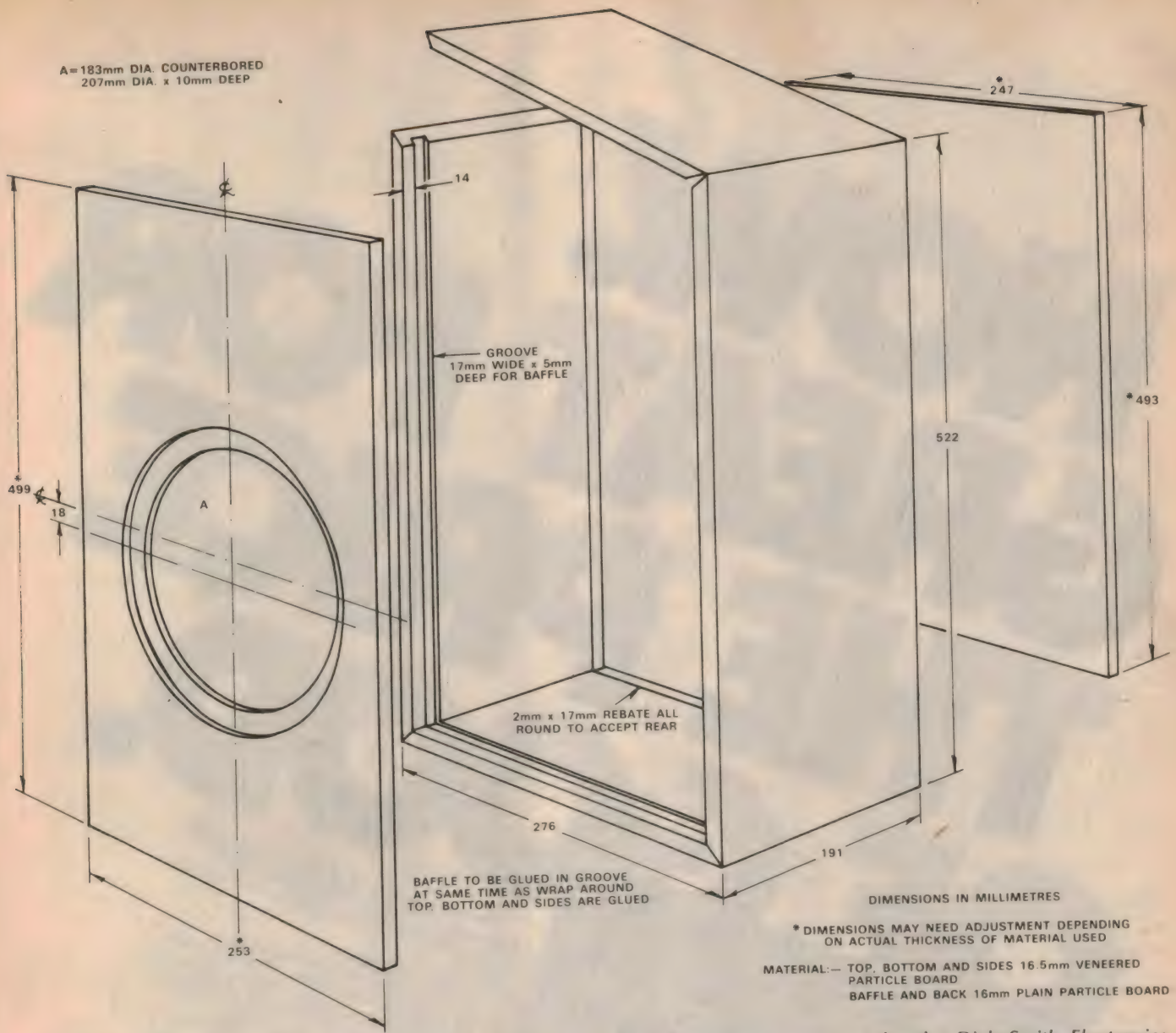
What of ordinary single cone drivers?

In many cases they will be perfectly adequate, even allowing for their more limited treble response. A good single cone driver should certainly sound much better than any small speaker in a portable radio or cassette player, and it may suffer by comparison only with much more pretentious systems if coupled to your hifi stereo system.

So much for the drivers. What about the enclosure?

Ideally, an enclosure should be designed around the selected driver and deliberate choices made about enclosure volume and damping, whether ported or sealed, and so on. Such discretion is not possible where the choice might fall on any driver in the shop and all one can do is to specify an enclosure that will look the part and be reasonably tolerant of the driver fitted into it.

This is the philosophy behind the enclosure, pictured, which is available as a pre-cut pre-finished kit through the Dick Smith



organisation—via retail outlets of Dick Smith Electronics or their distributors, or to the other companies on a wholesale/quantity basis.

The overall dimensions are a deliberate compromise between overall size (a general-purpose extension speaker can't afford to be too large), proportions (which have to be pleasing) and economy of cutting from a metric-sized sheet (a factor in the price). The internal volume works out at just over 17 litres—really too small for an 8-inch speaker by hifi standards—but still a lot better than the makeshift housing represented by a portable radio or cassette cabinet.

Rather than specify any kind of port, which could not be more than a dubious compromise, we retained the idea of a completely sealed enclosure but with the internal space largely taken up by Innerbond or a similar acoustic filling. Prototype pictures of the enclosure kit suggest the use of a flat battery resting against the back panel but we are suggesting the use of a free-standing roll of Innerbond instead.

Actual construction of the cabinet as pictured follows along similar lines to that used earlier in the year for our Playmaster 3-53L and 3-75L hifi systems—except that it is smaller and easier to handle.

Clear a space on the carpet and cover it with newspaper to avoid any traumas with a spilt adhesive. Carefully unfold the pack so that the sides, top and bottom, are lying flat, end to end, held together only by the material which forms the outer surface covering. If you mishandle the pack and fracture the "hinge" fabric, assembly will be complicated and the corner will need to be patched.

The dimensions shown are for the Dick Smith Electronics cabinet kit but a handyman could derive suitable dimensions for a fully home-made enclosure. A detail not shown in the drawing is that the edges of the panels in front of the baffle have been planed back to 13mm to make the enclosure look less cumbersome.

Now take the baffle and identify the front (the rebated side) and the top (the speaker is intended to mount slightly above centre).

In case you are wondering why the driver was not mounted near the top, the thought behind the design of this "universal" enclosure was to leave enough space for a tweeter in a more ambitious system—an option that has not been exercised on this occasion.

Having thus identified front and top, turn the baffle upside down and rest it in what will ultimately be the top of the cabinet. The intention is that the top of the cabinet will remain on the floor during assembly, while the sides and bottom are folded upwards. This will put the corner to be joined at the bottom when the cabinet is later turned the right way up.

Having identified what has to be done, run a line of PVC adhesive (Aquadhere is fine) along the entire rectangular slot which is to receive the baffle, and to the 45-degree bevels. Apply enough adhesive so that, when spread with a finger,

NOW. GREAT FOR THE PRICE OF GOOD.

There are a lot of good loudspeakers around these days. Especially if you're going to pay $300 or $500. Some are pretty good. Some are really good.

But good isn't great.

Introducing Bolivar Speaker Works.

We make two loudspeakers. Both are 3-way bookshelf systems. One is $468, the other $358. Both are really efficient. (Twice as efficient as the current leader in that price range.) You won't need a big receiver to get a big sound.

The enclosures are the same kind used for expensive loudspeakers, but we finished them in a warm-toned vinyl. No fancy wood veneers. We put the money in the sound.

Come listen to Bolivar. Then listen to any other speaker that costs about the same. You'll buy Bolivar.

Bolivar Speaker Works

Your nearest Bolivar dealer? That's easy. Write Bolivar Speaker Works P.O. Box 6, Brookvale 2100, N.S.W. or phone 939 2922

it will thoroughly wet all surfaces. Wet with adhesive the edges of the baffle, push it lightly into position and carefully fold the sides and bottom around it.

Bump everything firmly into position with the ball of the hand so that the final edges close tightly together and hold them in position with two or three straps of strong adhesive tape. Wipe off any surplus adhesive that may have reached the outside surfaces and leave the enclosure overnight for the adhesive to set.

If you want to make doubly sure of that final joint, prop the cabinet so that only the particular edge is on the floor and run a thin line of adhesive along the inside of the joint, leaving it to flow and set.

Next step is to fit the loudspeaker, which is intended to mount from the front, and into the rebate. The rebate diameter is shown as 207mm, which should accommodate most typical 8-inch drivers. If you are offered one that exceeds this dimension, you'll save yourself a lot of worry if you don't buy it!

The driver should form an airtight seal against the baffle and this can be ensured by pressing it home against a thin ring of non-hardening caulking compound. Better still, use a ring of adhesive-backed foam draught excluder (Engels No 5C, sold by hardware stores). If you use this, make sure to push a hole through it where the screws go through, otherwise it may tend to wind up in the thread.

The number and type of screws will have to be selected to suit the driver loudspeaker chosen but the most logical choice is self-tappers. Be sure to drill suitable pilot holes beforehand, angled slightly inwards; failure to do this may cause the chipboard to fracture. Care is needed during this operation to avoid putting a finger or a screwdriver through the cone!

The lead from the speaker can come straight out through the back, or via a plug and socket if you prefer it that way. Whichever method you employ, make sure that the outlet is substantially airtight, made so, perhaps, with the aid of a plug of caulking compound.

It is also wise to note any polarity markings on the driver; the "plus" connection is usually distinguished by a red paint spot, a red washer under the lug, or an actual plus sign. If there is no mark, touch two leads from a 1.5V cell across the voice coil and note which way round causes application of the voltage to move the cone forward. The end of the voice coil then being contacted by the plus of the battery is conventionally regarded as "plus".

Use a colour coded connecting lead so that the polarity will always be known in future. Polarity doesn't matter if you are using only one system but, if you have any thought of making up a stereo pair, they must be connected and operated in phase.

This done, take the length of Innerbond as supplied in the kit—nominally 700mm wide and 1 metre long. Fold it along one 1-metre side so that the width is reduced from 700 to about 500mm—the internal height of the enclosure. Roll it from both ends like a scroll and push it, folded edge down, into the enclosure, with the rolls either side of the driver.

Check that the back panel is going to fit snugly into the rebate, then wet the rebate and the edges of the back panel with PVC adhesive. Push the back panel into place and leave the enclosure face down overnight for the adhesive to set. Run a thin line of adhesive around the crack for good measure.

Next morning, wipe the surface over, press the grille into place and the job is done. No one will be able to guess that you put it together yourself.

We should, perhaps, make a couple of other points: The enclosure, as pictured, was fitted with a Rola C8MX twin cone driver—a once very popular Australian-made unit that still seems to be fairly widely available. Typical of drivers with a fairly stiff cone assembly, it exhibited prominent output in the sealed enclosure in the region 90-150Hz, falling away steeply below about 80Hz.

Assembling your own cabinet shouldn't be as easy as this, but it is! There's just one thing wrong with this posed picture: The baffle is the wrong way up. The speaker cutout should be closest to the top of the enclosure which is resting on the floor at this point in the assembly procedure.

An alternative seen in one of the pictures, is a more expensive Vanco model SR-8MM, being stocked by Dick Smith Electronics. Typical of drivers with a lower cone resonance and a larger magnet, it mates more naturally with a small sealed enclosure, giving a much flatter response down to about 70Hz, rolling off steeply below that. This would be much the better class of driver to fit, if you have any idea of using the enclosure in the role of a "bookshelf" speaker in association with a domestic stereo system.

The other point is about the enclosure itself. The handyman who fancies his woodworking skills can certainly make a similar enclosure from solid core sheets or particle board but it must be rigid, it must be airtight and it should be proportioned so that height, width and depth are dissimilar, as in the original design. It can have a larger internal volume, if size is no problem, but it should not be smaller because of internal air loading on the cone.

Left: The completed Universal Loudspeaker System with the C8MX driver in position. There is ample room above it for a sealed back tweeter, if a more complex system is desired. With the foam grille in position—it could be sprayed any desired colour—the system will take on a fully professional appearance, as at right.

A low distortion audio oscillator

For those who need to make distortion measurements relatively infrequently, the cost of a high-grade commercial audio generator is scarcely justified. This article describes a low cost, easy to build oscillator which provides three switched frequencies at lower than 0.1% distortion.

by F. G. CANNING
30 Back Beach Road, Portsea, Victoria 3094

Some years ago Dr A. R. Bailey described a mains operated sine-wave generator using valves and giving a considerable output with very low distortion —below 0.01% at most frequencies. (Electronic Technology, February 1960, p. 64)

Such a generator can be very useful as a reference standard of known purity for the testing of amplifiers, filters, distortion meters etc. Having need for such a source, but of a less elaborate and expensive construction, I thought it worthwhile to try to develop something on the same general lines but using semiconductors and operating from batteries. This article describes the resulting instrument, stable in frequency and output and able to deliver any voltage up to 1.5V RMS at three spot frequencies, with distortion well below that of most apparatus likely to be under test.

The design basis of such an oscillator was clearly set out by Dr. Bailey. Very briefly, it calls for an amplifier, itself of good linearity and low noise, whose distortion is then further reduced by heavy negative feedback. Since the distortion will be reduced in direct proportion to the amount of feedback which can be used it is evident that our amplifier should have very high gain ("open-loop gain") to start with, thus allowing a large amount of feedback to be applied. For example, if the amplifier initially gives 10% total harmonic distortion, together with enough gain and stability to allow 60dB of feedback to be used (gain reduction of 1000 times) we shall have the theoretical possibility of achieving 0.01% total distortion, provided we can make the feedback effective only for the harmonics while leaving the fundamental frequency unaffected. We can do this by providing an additional feedback path through a frequency-selective network (a "Notch Filter") and applying positive feedback through this path, only sufficient to just cancel the negative feedback and thus to start oscillations at a frequency determined by the network. In the present case a parallel-T network is used and is unbalanced to the degree necessary to give the required positive feedback by slightly reducing the resistance of the shunt arm of the parallel-T from the theoretically correct value.

The close balance needed between the positive and negative feedback voltages to barely sustain oscillation is, of course, highly critical, for the tendency is for the oscillation, once started, either to die out again or else to build up until limiting sets in somewhere in the amplifier, with attendant extra distortion. In the present design oscillation amplitude is stabilised by including in the negative feedback path a thermistor, type R54A, having a negative coefficient of resistance; i.e., its resistance falls as its temperature rises due to increased voltage across it and the consequent increase of power dissipation.

The thermistor forms one arm of a potential-divider connected across the oscillator output, from which the negative feedback is derived (see Fig 1). It can be seen that if the output voltage tends to rise, dissipation in the thermistor will also rise and its resistance will consequently fall, thus increasing the voltage fed back in anti-phase to the input and so restoring the output voltage to the original figure.

Looking at Fig. 1, Tr1 together with Tr3 form the high-gain amplifier stage and Tr2 is a buffer and impedance-transformer matching the very high output impedance of the amplifier stage to the low-impedance output circuit. Tr1 and Tr2 are both monolithic Darlington transistors, type MPS-A12 (Motorola). It is a low-noise device having very high and linear current gain (minimum 20,000), very high input impedance and low output impedance, and low inter-electrode capacitances. It is therefore inherently suitable for linear and stable amplification with heavy feedback and this capability extends to quite high frequencies, unlike some of the operational amplifiers currently popular.

Fairly obviously a single MPS-A12 can be made to give very high voltage gain, if we can devise a sufficiently high collector circuit load without incurring excessive voltage drop in it or reducing the collector current too much and so spoiling the high transconductance available.

To get the gain we want requires an AC collector load of half a megohm or more, but a resistor of this size would incur both of the foregoing penalties. However, a junction field-effect transistor used as a constant-current device provides an ideal load of as much as one megohm according to type, with a drop of only 5 to 10 volts; also, by inclusion of a variable source resistor its working current and that of TR1 can be set to a desirable value in spite of variations in individual transistors. With such an arrangement, open-loop stage gains of 2000 to 5000 times can be had together with an input impedance of 100k ohms or more.

The choice of output impedance in the emitter circuit of TR2 is mostly determined by the requirements of the stabilising thermistor. The R54A has its optimum working point with around 1.5 volts RMS of signal across it, and its working resistance is then about 1500 ohms. Taking into account the several other parallel resistive paths and assuming a lowest external load of 10k ohms, the effective load seen by the emitter of TR2 is about 580 ohms. To produce an undistorted output voltage of 1.5V RMS across this load requires a peak voltage of $\sqrt{2}$ x 1.5, or 2.12 volts, so TR2 must therefore

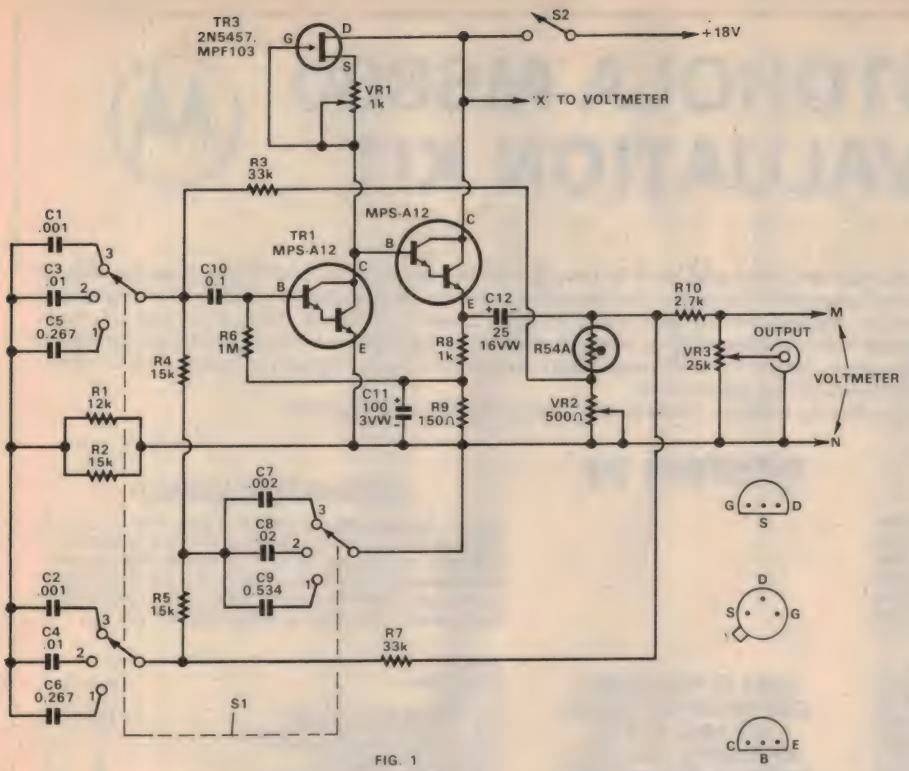


FIG. 1

The circuit provides three switched sine-wave frequencies at lower than .01% distortion and can deliver any voltage up to 1.5V RMS.

PARTS LIST

RESISTORS All ½ watt 5% unless otherwise stated.
R1 12k 2%
R2 15k 2%
R3 33k
R4 15k, matched to R5 (see text)
R5 15k, see above
R6 1 Megohm
R7 33k
R8 1k
R9 150 ohms
R10 2.7k
R11 1 Megohm
R12 1 Megohm
R13 82k
VR1 1k trimpot
VR2 500 ohms wirewound (see text)
VR3 25k wirewound linear
VR4 5k trimpot, linear
VR5 47k trimpot, linear

CAPACITORS
C1, C2 0.001uF, matched, polyester or polystyrene, 60 volts up
C3, C4 0.01uF, matched, as for C1 and C2
C5, C6 0.267uF, matched, polyester (see text)
C7 0.002uF, polyester or polystyrene (see text)
C8 0.02uF, polyester or polystyrene (see text)
C9 0.534uF, polyester or polystyrene (see text)
C10 0.1uF, polyester, 60 volts up, 10%
C11 100uF 3V tantalum electrolytic
C12 25uF 16V tantalum electrolytic
C13 0.047uF polyester, 60V up
C14 4.7uF 30V tantalum electrolytic

SEMICONDUCTORS
TR1, TR2 MPS-A12, (Motorola)
TR3 2N5457 or MPF103
TR4 2N4393 or 2N5459/MPF102
D1, D2 0A5 (see text)

MISCELLANEOUS
50 microamps DC meter
Range switch 3-pole 3-way rotary, shorting
On-Off switch, single-pole on-off, to choice
Output jack and plug, to choice
Thermistor, STC type R54A (Instant Component Service Ltd)
Metal Case, matrix board, or tag strips, wire, knobs, etc
Batteries, 2 off: 9 volts, type 276P or equivalent.

supply a peak current of 2.12/580 or 3.7 milliamps. It must accordingly have a standing collector current of at least this amount to operate in Class A without distortion. In this design the current is set at 9mA to give an ample safety margin.

As TR1 and TR2 are DC coupled, the bias of the base of TR1, derived from a tapping on the emitter resistance of TR2, effectively controls the working point of both stages. It is set to give a standing 8 to 9 volts from TR2 emitter to ground, to allow ample room for the expected signal voltage swing. The collector voltage of TR1 is therefore around 10 volts. It should be noted carefully that the maximum permissible collector voltage for the MPS-A12 is 20 volts, so the design figure of 18 volts for the supply should not be exceeded, in case of accidental short-circuit across TR3.

The preferred FET for TR3 is the 2N5457 or its equivalent MPF103 because of their very flat drain-current curves and consequent high dynamic impedance. Other types tested successfully include 2N3819 and 2N4416. The recommended drain current, which is also virtually the collector current of TR1, is 3 to 3.5 mA. Some examples of the 2N5457 will fall within this range at zero gate bias. However, as Idss (the zero-bias drain current) of FETs varies greatly from sample to sample, VR1 is provided to allow the drain current, if higher than the desired figure, to be reduced as needed.

Samples having a lower drain current than the recommended figure, even with VR1 set at zero, may not be suitable for this circuit. The recommended current is not very critical and the circuit will operate well with currents lying between 2 and 4 milliamps, but distortion does increase slightly and measurably at less than 3 milliamps.

The basic configuration for the parallel –T filter circuit is given in Fig. 2, together with the formula for the null frequency. It is theoretically capable of giving an absolute null but this is not acheived in practice, partly due to losses in the capacitors, apart from the difficulties of precise component matching. In the present application the null frequency would nominally be the frequency of oscillation, but the actual frequency will differ slightly due to the loading on the filter and also to the need to unbalance it a little to provide some positive feedback as earlier explained.

The frequency can be varied by changing, either all the resistances or all the capacitances simultaneously, or both together while maintaining strict proportionality. Continuous variation of the capacitances is not practicable for low frequencies because they are too large. Variation by change of resistances is possible but awkward, requiring the ganged control of two closely-matched variable resistors and a third of half the value; not a normally available component.

The present design uses switched fixed capacitors to give three spot frequencies of 40Hz, 1kHz and 10kHz, covering those audio frequencies most likely to be significant for distortion measurements. 40Hz was chosen to keep clear of the 50Hz mains frequency, which can produce a surprising amount of stray harmonic and noise radiation which, if picked up directly by the measurement set-up or by, say, a common earth connection, can show up on the measured

Low distortion audio oscillator

signal as apparent distortion which may be mistakenly attributed to the oscillator.

From the given formula, with R = 0.015 megohm, the capacitances for the three frequencies are:

F	C	2C
40Hz	0.267 uF	0.534 uF
1kHz	0.01 uF	0.02 uF
10kHz	0.001 uF	0.002 uF

For capacitance C, 0.01 and 0.001 uF are standard values and 0.267 is obtained by parallel connection of 0.22 and 0.047 uF. For the 2C components, 0.02 requires two 0.01 units paralleled and 0.002 is obtained in the same way. 0.534 uF requires four preferred values, namely two 0.22 uF and two 0.047 uF all in parallel.

It is not necessary that all capacitors should be of these exact values because departure from them will only affect the frequency proportionally. What is essential is that the R's and C's should be matched closely to each other in pairs, if possible to within one or two percent, and that 2C should then be twice C to within the same percentage. The range switch controlling the capacitors is a normal 3-pole 3-way rotary type.

The shunt-arm resistor, nominally R/2, has to be lowered from this theoretical value to unbalance the circuit for positive feedback. The required resistance turns out, in this case, to be 6.6k instead of the theoretical 7.5k. This non-standard value is obtained with 12k and 15k resistors in parallel (Fig.1, R1 and R2). They should be within 2% tolerance.

Three variable resistors are used, of which VR1 can be a small pre-set trimpot fitted internally as it is used only once in initial setting-up. VR3 is the output attenuator, a wire-wound linear potentiometer with suitable dial scale. VR2, of 500 ohms, is a front-panel control used to set the maximum output level to 1.5 volts. It is a fairly critical adjustment which is facilitated by using a multi-turn wirewound unit such as the Beckman "Helipot" type 7266, but a normal wirewound linear potentiometer can be used for economy.

The oscillator can supply output loads down to 10k ohms without noticeable loss of purity or output, but lower loads are not advisable unless a matching-pad of at least 10k ohms input resistance is interposed, with consequent reduction of available voltage.

There is nothing critical about layout or dimensions and any construction can be used as preferred. The tidiest assembly is probably on pierced 0.1 inch matrix-board, but the prototype used tag-strips. A printed-circuit board could be used if the constructor thinks it worth the time and effort of preparation for a "one-off" job. The front panel will carry the "ON-OFF" Switch, the "RANGE" Switch, the "SET MAXIMUM OUTPUT" resistor VR2 and the "OUTPUT ATTENUATOR" VR3. The output jack can be a simple phono socket to take a matching plug and shielded output cable, or a more elaborate type if desired.

It is very necessary to house the oscillator, preferably with its batteries, in a substantial metal case to aid thermal stability by excluding draughts and strong lights, and also to provide good electrical screening. Otherwise there is likely to be pick-up of stray interference, especially from adjacent mains-operated equipment, which may appear as spurious distortion. In theory, most such interference should be suppressed by the heavy negative feedback (except interference at the frequency of oscillation) but I have not found it so in practice.

It is best to isolate the earthy side of the circuit, including the output jack, from the case and to provide a separate earth terminal on the case itself for use in any situation where earthing it seems beneficial. Normally, best results will be had with one earth connection only, located at the input terminal of the apparatus under test.

Mains supply to the oscillator has been tested but found undesirable, again because of mains-borne interference spoiling the waveform unless considerable extra shielding and filtering are used. Similarly, supply regulation by zener diode was rejected because of the noise commonly generated by these diodes. The best and simplest supply seems to be fresh batteries of ample size, enclosed within the shielding. The total drain is 12 to 13 milliamps.

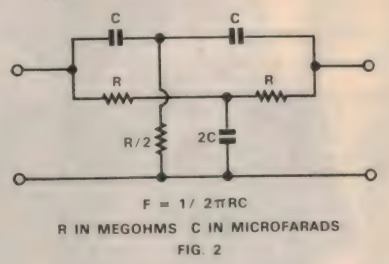


Fig. 2: Basic configuration for a parallel-T filter circuit.

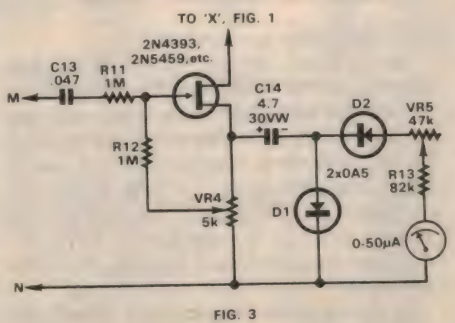


Fig. 3: This simple voltmeter circuit can be added to the basic circuit if desired.

Setting-up involves only the temporary insertion of a meter in the drain circuit of Tr3 while setting the current to about 3.5 milliamps by adjustment of VR1, or selection of a suitable transistor. The case can then be closed.

Next, connect a high-impedance AC voltmeter (preferably an electronic type) to the output with the output attenuator at maximum. With the range switch set to 1kHz, switch on and vary the "SET MAXIMUM" control VR2 until oscillation is seen to start by appearance of voltage at the output; if this exceeds 3 volts, increase VR2 quickly to avoid overloading the thermistor for any considerable time (though they are quite robust).

Allow five to ten minutes for thermal stability to be reached before finally setting VR2 to bring the output to 1.5V RMS. Thereafter the output should not vary more than plus or minus two percent unless the frequency range is changed or the oscillator is switched off and on again.

If an electronic voltmeter is not available an ordinary VOM of good quality may be used to set the output voltage, if it has an AC resistance of 10k ohms per volt or higher. But only use it on the 40Hz range; such meters are usually extremely inaccurate at higher frequencies.

Having reached a stable output voltage, it is as well to disconnect the voltmeter before using the oscillator to measure distortion, because some voltmeters, depending on type, may themselves distort the output signal by unsymmetrical loading of waveform through the rectification process used.

The total harmonic distortion at 1kHz is so low that accurate measurement is difficult with conventional Distortion Factor Meters, being comparable to the instrument and environmental noise, but is certainly of the order of 0.01% or better. Measurement with a good Wave Analyser, probably preceded by a tunable filter, is likely to show a figure nearer to 0.005%. The distortion rises by roughly one-third at 40Hz and 10kHz.

The following points should be kept in mind;

1. Particularly on the lowest frequency, oscillation will not usually commence for 10 to 15 seconds after switching on. This time is needed to complete charging of the network capacitors and to reach the operating point of the thermistor after the switch-on surge.

2. Oscillation amplitude will always exceed the desired 1.5 volts when first switched on and the above-mentioned five to ten minutes thereafter will be needed to reach thermal stability.

(continued on page 117)

Transistor Switching for High Power Headlights

High switch-on current surge is probably the greatest cause of failure in relays used to control driving lights on motor vehicles. Here is a circuit of a switching unit for two 100W (or less) driving lights which reduces the switch-on surge by using power transistors in place of relays.

by S. D. WOITHE*

A characteristic of all incandescent lamps is that the cold resistance of the filament is many times less than its resistance at operating temperature. 100W driving lights have a cold resistance of about 0.1 ohm and a working resistance of about 1.7 ohms at the rated 13V. Therefore, where heavy gauge connecting wire is used, two of these lights operating from a single relay can cause a switch-on surge of close to 200A through the relay contacts.

When the lamp is connected in the collector circuit of a suitable common emitter connected power transistor, a very effective switch-on surge limiter results. The principle of operation is based on the characteristic that the collector current of a transistor remains substantially constant for collector to emitter voltages of one volt upwards, provided the base current is held constant. Refer to Fig. 1. When S1 is closed and the filament is cold, the current through it will be limited to that set by the gain of the transistor and the value of the base resistor.

As the filament heats up its resistance increases and the voltage across the transistor drops to a low value. At the same time the current through the lamp settles down to its operating level of about 7.7A. Thus the circuit in Fig. 1 not only switches the high current required by the lamp, but acts as an effective switch-on surge limiter as well.

The full circuit diagram of a transistor switching unit for two 100 watt driving lights is basically an extension of Fig. 1 and is shown in Fig. 2. However, T3 has been added to enable the circuit to be switched from a positive voltage. When the lights are switched to high beam, voltage from the high beam circuit appears across R10 and R9, causing T3 to conduct. If S1, S2 are closed this will cause T1 and T2 to also conduct because the base drive resistors for T1 and T2 form the collector load of T3.

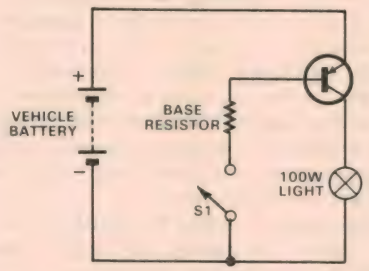


FIG. 1

Fig. 1. A basic circuit illustrating the principle of transistor switching and surge current limiting.

An optional feature included on this circuit is a LED "driving lights on" indicator. When either or both lights are on, D1 and/or D2 provides a voltage to drive the LED indicator, thus providing a useful indication that either or both lights are on. Two fuses, F1 and F2, situated on the battery side of the switching unit, are included for protection against short circuits which may occur in the lamps.

Before constructing this unit, check the ability of the alternator/generator to supply the extra current required by the driving lights. If part of the extra current has to be supplied by the battery, the voltage will drop below 13 and make the installation unsatisfactory.

The construction of the unit is not critical; any form which is reasonably rugged mechanically can be used. The photograph of the unfolded unit (Fig. 3) shows one form this can take. Notice how the transistors are wired to the printed board and how the wires are looped for ease of assembly. When the unit is fully assembled, the board is mounted with the components underneath and the pattern facing the bottom of the heatsink.

Also shown are three ¾ inch long by ⅛ inch diameter bolts used to mount the board to the heatsink. A full size drawing of the board, which will be distributed to the trade, is given in Fig. 4. The wires from the indicating LED and isolating switches connect to the board via automotive spade connectors and small brass strips soldered and bolted to the board pattern. These brass strips (copper may be used instead) are cut from 20SWG plate and measure 16mm x 6.5mm. Alternatively small bolts, nuts, spring washers and solder lugs may be used.

Insulating washers must be used when mounting T1 and T2 on the heatsink. This

A top view of the finished unit, showing the two switching transistors protected by plastic covers. One edge of the printed board can be seen together with the brass strips which are designed to mate with auto type spade connectors.

* 58 Meakin St, Watsonia, Victoria, 3087

must be done carefully, otherwise a short may develop in operation, and destroy a transistor. Electrical connection between the lamps and wires to the unit is via automotive "bullet" type connectors.

As the unit is of open construction, it is susceptible to the accumulation of dirt and moisture. While this will not greatly affect the unit electrically, it can cause corrosion to form. Therefore the circuit board pattern and all the component leads, including the exposed transistor terminals (but not the wire wound resistors), should be coated liberally with insulating varnish. Nuts and bolts can be treated the same way.

The metal cases of T1 and T2 should be protected with TO3 plastic covers since, when the lights are on, these cases are effectively at full battery voltage. A drop or two of contact adhesive may be applied to prevent them from vibrating off during use.

Due to the high surface temperature of wire wound resistors (over 250°C) it is not recommended that the printed board be mounted in an enclosed box where air circulation is minimal. It is quite possible that the temperature rating of T3 could be exceeded and the board itself severely charred by the hot wire wound resistors.

The supply voltage is taken from the output terminal on the alternator. Where this cannot be done, such as with certain alternators which use a large recessed spade connector as the terminal, the nearest accessible terminal to it should be used. In generator equipped vehicles the take-off point must be on the battery

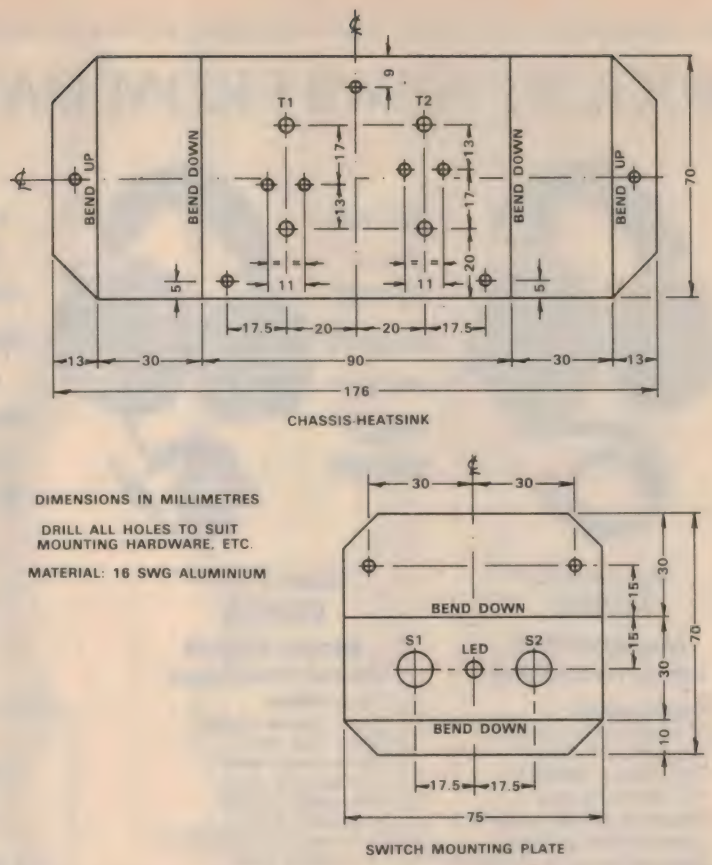
PARTS LIST

2 MJ2955 or 2N4908 PNP transistors
1 TIP31A or 2N6121 NPN transistor
2 IN914 silicon diodes
1 LED
2 SPST switches
5 Automotive spade connectors with plastic covers
2 Automotive bullet connectors with brass bullets
2 In line fuse holders
2 7.5A fuses
2 TO3 transistor covers

RESISTORS
5 470 ohm ½ watt
1 68 ohm 5 watt
2 10 ohm 10 watt
2 4.7 ohm 5 watt

Fibre glass printed board 77/a1/8, 66mm x 85mm. 18 gauge aluminium sheet 255mm x 70mm. Approx. 4 metres 19/0.012 (3mm automotive) wire. Approx. 10 metres 10/0.010 hook up wire.

MISCELLANEOUS
Nuts, bolts, washers, lockwashers, 20 gauge brass, solder lugs, self tapping screws, insulating varnish.



Chassis and control panel metal work. Take care that all mounting holes for the MJ2955 transistors are de-burred, to avoid damaging the insulating washers. Since the chassis is also a heatsink, aluminium is the preferred material.

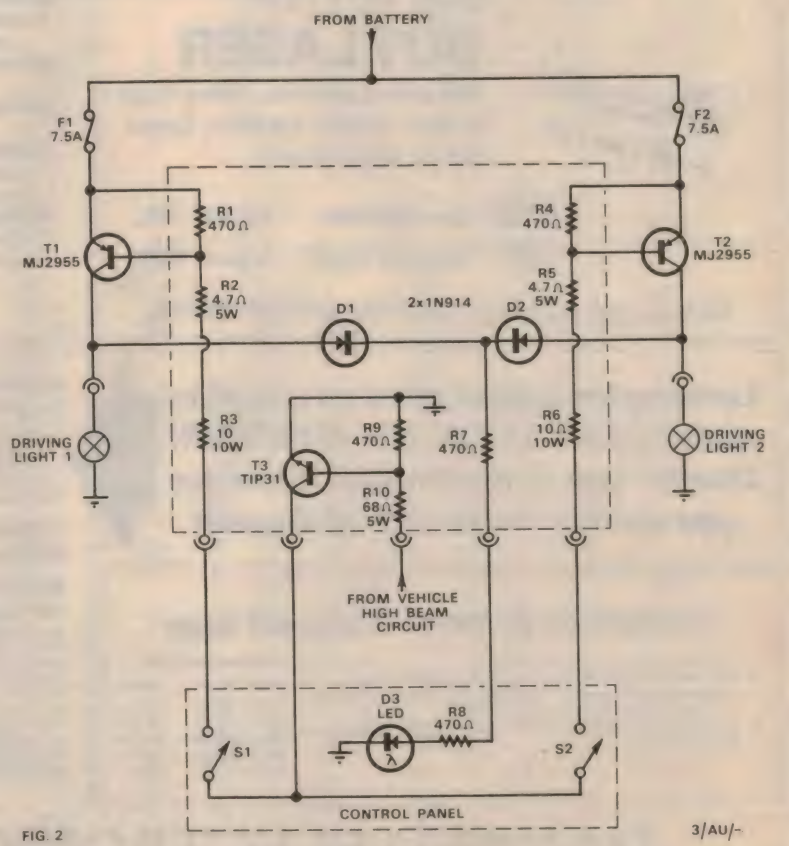


Fig. 2. The practical circuit derived from Fig. 1. A major addition is T3, which has been added to allow the switching transistors to be controlled by a positive voltage. Note the (optional) LED indicator circuit.

AUGUST NEWS FROM DAVRED

Normal Price ~~$14.00~~ August Price ONLY $12.35

Usual Price ~~$19.00~~ Month of August JUST $16.50

NEW! EXCLUSIVE LASER Model SH112 Stereo Headphones

FANTASTIC VALUE $5.85

Specifications:
2¼" Dynamic speakers
Freq response 20-18,000 HZ
Impedence 8 ohm
Max power 300 mW
6-foot straight cord

$Special Value$

FORTE
Model KH508
Stereo Headphones

Specifications:
2¼" Dynamic speakers
Impedence 8 ohm
Max power 200mW
10-foot curly cord
Separate volume controls
Stereo/mono switch
Freq response 20-20,000 HZ

$Super Value$

FORTE
Model KH709
Stereo Headphones

Specifications:
Slider volume controls
Slider tone controls
Stereo/mono switch
10-foot curly cord
Max power 500mW
Impedence 8 ohm
Freq response 20-20,000 HZ
3" Dynamic SPKS

.Up-to-date information on STOCK ADDITIONS

TL-2 Antenna	$39.37
Spirex Antenna	$5.40
Ni-Cad Rechargeable Batteries	
D size 3500 mAh	$7.25
Sealed Rechargeable Lead/Acid Batteries	
NP8-6A 6 volt 8.6 AH	$11.30
NPK 4.5-12, 12 volt 4.5 AH	$27.76
KQD310 Heatsink for TO5 Can dia. 25 mm length 5 mm	35c
K4 DH308 Heatsink for TO5 Can dia 18 mm length 5 mm	32c
T502 Vernier Dial takes ¼" 180° Great for tuning	$4.00
RM007 Echo Box	$14.95
EX220 Electret Condenser Uni-directional Pencil Style	$19.95
Microphone. Uses 1.5V Penlight Batt.	
Laser Speaker Crossovers. 2-way crossover freq.	$3.50
6000Hz slope rate 6db per octave	
3-way crossover freq	$8.35
Mid/Bass	800Hz
Mid/Tweeter	8000Hz
Slope rate 6db per octave.	

BUY BETTER
BUY LASER

We offer Laser low noise/high output, quality cassette tapes during August only.

C60 Normally ~~99c~~. August **79c**
C90 Normally ~~$1.25~~ August **99c**

SAVE ALL THE WAY WITH DAVRED BETTER PRICES

Looking for a good price on a quality multimeter? LOOK NO FURTHER! Davred has a multimeter offer for you during the month of August

Model OT-2 20K ohms/ V DC .10K ohm/V AC

Specifications:
0-2.5, 10, 50, 250 and 1000V DC
0-10, 50, 250, 500and 1000V AC
0-50uA, 25mA and 250mA DC Current
0-500, 5K and 50K ohms resistance

NORMAL PRICE ~~$29.50~~
SPECIAL PRICE $23.95

Model OT-5 50K ohms/V DC and 10K ohm/V AC

Specifications:
0-0.3, 3, 12, 60, 120, 300, 600 and 1200V DC
0-6, 30, 120, 300, 600, and 1200V AC
0-30uA, 6, 60, 300mA and 12 amp DC current
0-10K, 1m, 10m, and 100m ohms resistance
0-6, 30, 120, 300 and 600 audio output voltage, −20 to and 17db (Reference 0db = 0.775V = 1 mW in 600 ohm) Decibel
Overload protection circuit.

NORMAL PRICE ~~$39.50~~ **SPECIAL PRICE $32.90**

instructions for the do-it-yourself buyer

1. Print your name and complete address.
2. Give the part number and description of all goods required.
3. Add up amounts and total. If applicable add extra postal charges (Calculate postal charges on scale opposite.)
4. Total all the above items and forward cheque or postal order to address below

POSTAL CHARGES	
Order value	Charge
$5 — $9.99	Nil
$10 — $24.99	$0.50
$25 — $49.99	$1.50
$50 — $99.99	$2.50
$100 or more	$4.00

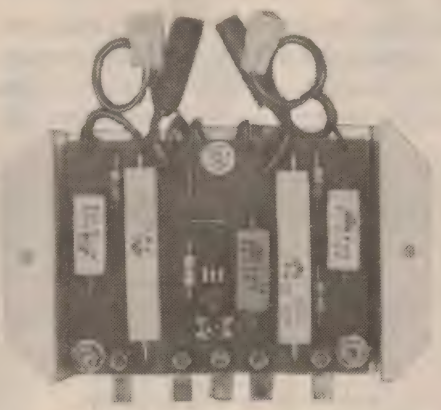
DAVRED ELECTRONICS PTY. LTD.

104-106 King Street Newtown Sydney Australia P.O. Box 317 Newtown, N.S.W. 2042 Telephone 516-3544

side of the regulator cut out. Most vehicles have an auxiliary terminal, usually at the fuse box, which may be used for this purpose.

For the high current side of this installation any of the following common sized wires may be used; 16/0.012 inch (3mm automotive wire), 25/0.01 inch, or 32/0.0076 inch. For wiring the switching unit to the control panel, ordinary hookup wire is suitable. The mounting position of the unit is not critical, although it is advisable to mount it where air is circulating, but away from the influence of the radiator. The small control panel should be mounted in a position where the indicator is visible to the driver sitting in his normal position.

One effect of this switching unit which may appear to be a disadvantage is that the lamps take about half a second from switch-on to reach full brilliance. This is caused by the switch-on current now being much lower and taking longer to heat the filament to operating temperature. This should not be a problem where, as in this circuit, these lamps are controlled by the high beam circuit, since these latter lamps will provide adequate illumination during the warm up period.



Underside view of the complete unit. Compare this with the overlay pattern, bottom left, and the picture at right.

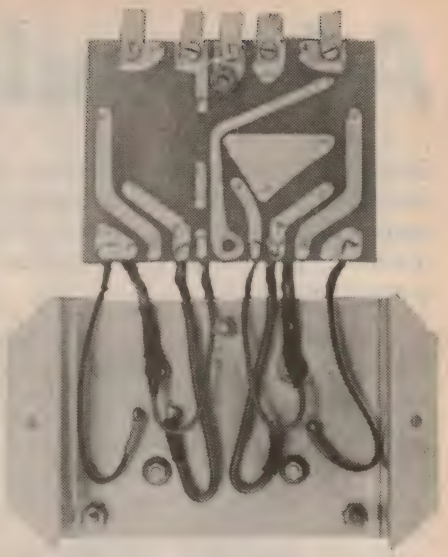


Fig. 3. The board "unfolded" from the chassis, showing the flexible wiring arrangement to facilitate assembly.

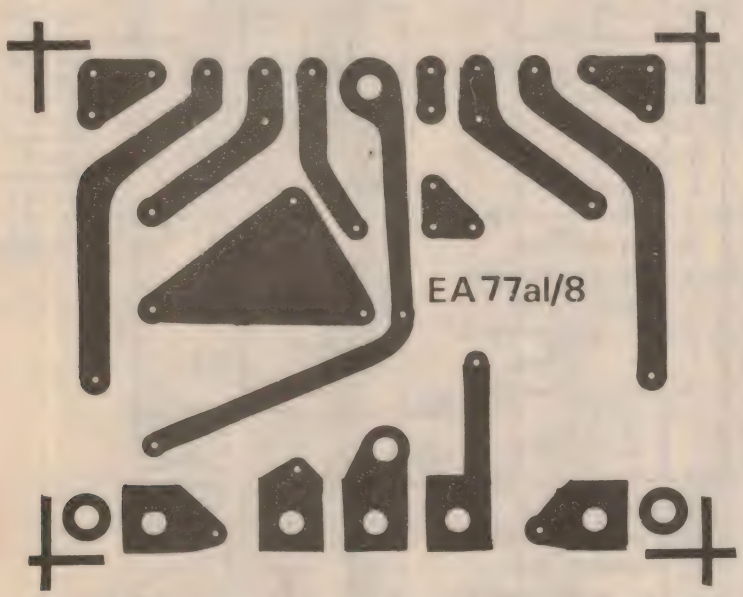
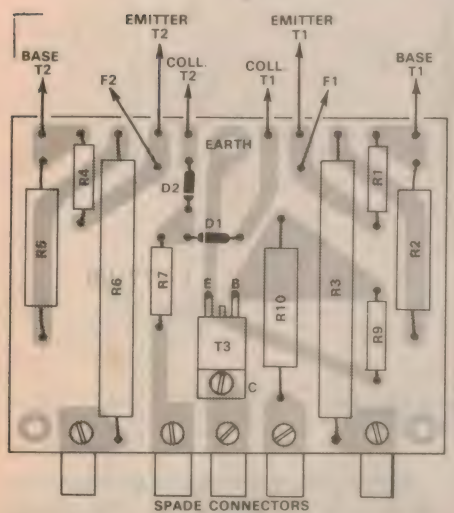


Fig. 4. Full size reproduction of the printed board. Ready-made boards should be available through trade outlets.



Overlay pattern showing the component side of the board and identifying the flexible leads which connect to it.

At switch-on the collector current of the switching transistors is between 10 and 15A and most of the battery voltage appears across them. Therefore for about 200 milliseconds after switch-on the collector dissipation of the transistors can be in the region of 200W. (The MJ2955 has a dissipation of only 150W at a case temperature of 25°C.) I have not had a transistor failure which can be attributed to this high initial dissipation but, even so, the following tests are recommended after the unit is installed on the vehicle.

Take the vehicle for a run to get the regulator warmed up, and the battery fully charged. Next, with the engine running at a fast idle (about 1500rpm), switch the lights on for about two seconds and then off again. Repeat this about twenty times, at ten second intervals. If the transistors survive this test they are unlikely to fail in operation from this high initial dissipation.

Since a high saturation voltage causes the transistor power dissipation to be high, a further test which should be made is to measure the collector to emitter voltage of T1 and T2 with lights on and engine switched off. For reliable operation this should be below 0.9V.

While this unit was initially designed to switch 100W driving lights it can be used to switch the popular 55W lights without modification but, because of the lower current requirements, several components can be changed to reduce cost. The base drive resistors for T1 and T2 can be replaced by a single 27ohm 10W resistor, and the base drive resistor for T3 can be replaced with two 220ohm 1W resistors in parallel. Furthermore, less expensive transistors, such as the 2N5871, may be used for T1 and T2.

This unit can be readily modified to suit individual fancies. For instance, if only one isolating switch is used and the LED "driving light on" indication circuitry omitted, quite a significant cost saving will result.

Another alternative is to substitute 5¾ inch diameter, 100W sealed beam inserts for the inner pair in a quad headlight equiped vehicle. In this case both isolating switches and the mounting panel may be dispensed with.

A hexadecimal keyboard

Designed to eliminate the tedium of binary input switches, this low-cost hexadecimal keyboard should find immediate appeal with microcomputer enthusiasts who cannot afford a teletype or VDU. The unit uses readily available parts, and can be built around a suitably modified calculator keyboard.

by A. K. LOVEJOY

The project to be described is the result of a personal desire to "tread the middle ground" between an expensive teletype or video display terminal and a cheap but rather tedious binary switch system. By good fortune, the final cost of this project was no more than for a basic switch system—about $10.00.

The unit comprises a "modified" ex-calculator keyboard (minimum 18 keys), a hexadecimal diode encoder, two quad latches and an automatic steering and latching circuit. The output is in the form of two parallel binary-encoded hexadecimal digits (the first we call the left hand or LH and the second the right hand or RH), which by user's choice may be high state or low state logic. The first entry steers left, while the second and subsequent entries steer right.

Keyboard operation commences by pressing the "clear" button to give an output response of 00. The first choice of digit (0-9 or A-F) is now made, and this choice is duplicated on both outputs. However, only the LH digit is "hard latched"; subsequent operations change only the RH digit until the keyboard is cleared. This latter feature simplifies operation, as many operation codes have a common first digit.

The CR (carriage return) command was added to the circuit almost as a postscript, although admittedly this is a desirable feature. Operation of the CR key gives an instant 0D (hex) on the output bus lines, and no clearing is necessary prior to giving the command.

Construction will depend partly upon the choice of keyboard, and selection preference should be in favour of older and larger types which permit easy modification. Alternatively, one could use separate SPST momentary contact pushbuttons.

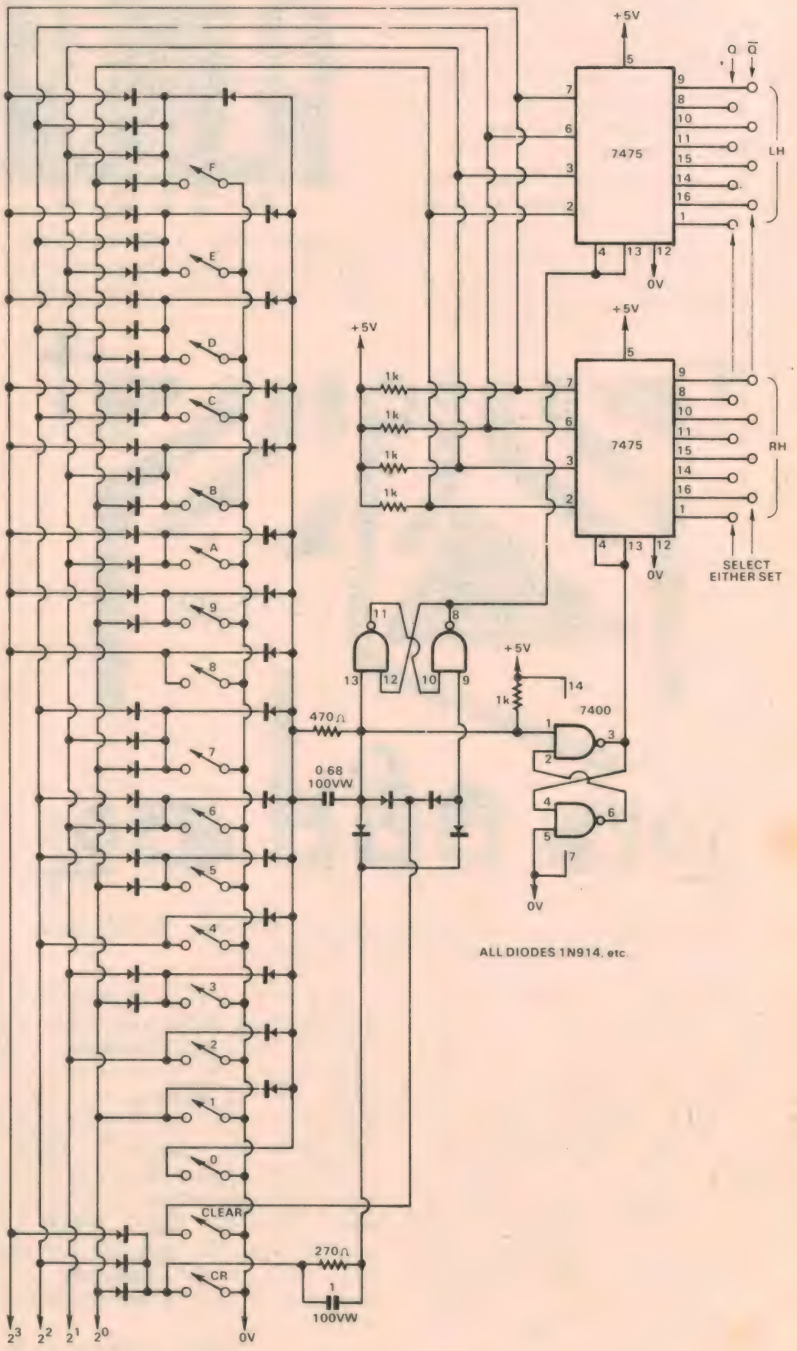
A word of warning concerning the small silicon diodes used in the circuit. Be wary of bulk purchases of so-called "hobby" or "untested" packs. My pack of 50 contained no less than 43 beautifully-encased short circuits!

The prototype was constructed on 0.1in Veroboard and connected to the microprocessor by a short length of 12-wire rainbow cable. The latch output set (Q or Q-bar) is chosen according to whether a high or low state transition is required.

As shown the keyboard is intended for parallel interfacing, in place of a set of binary switches. For serial interfacing, the latch outputs could be connected to the transmitter section of a UART.

Power supply requirements are a modest 75mA at 5V. In most cases, this may be derived from the existing microprocessor supply.

Finally, six of the non-numerical keys have to be re-labelled A-F. The easiest short-term method is to use plastic embossing tape cut into squares and stuck to the keys tops.



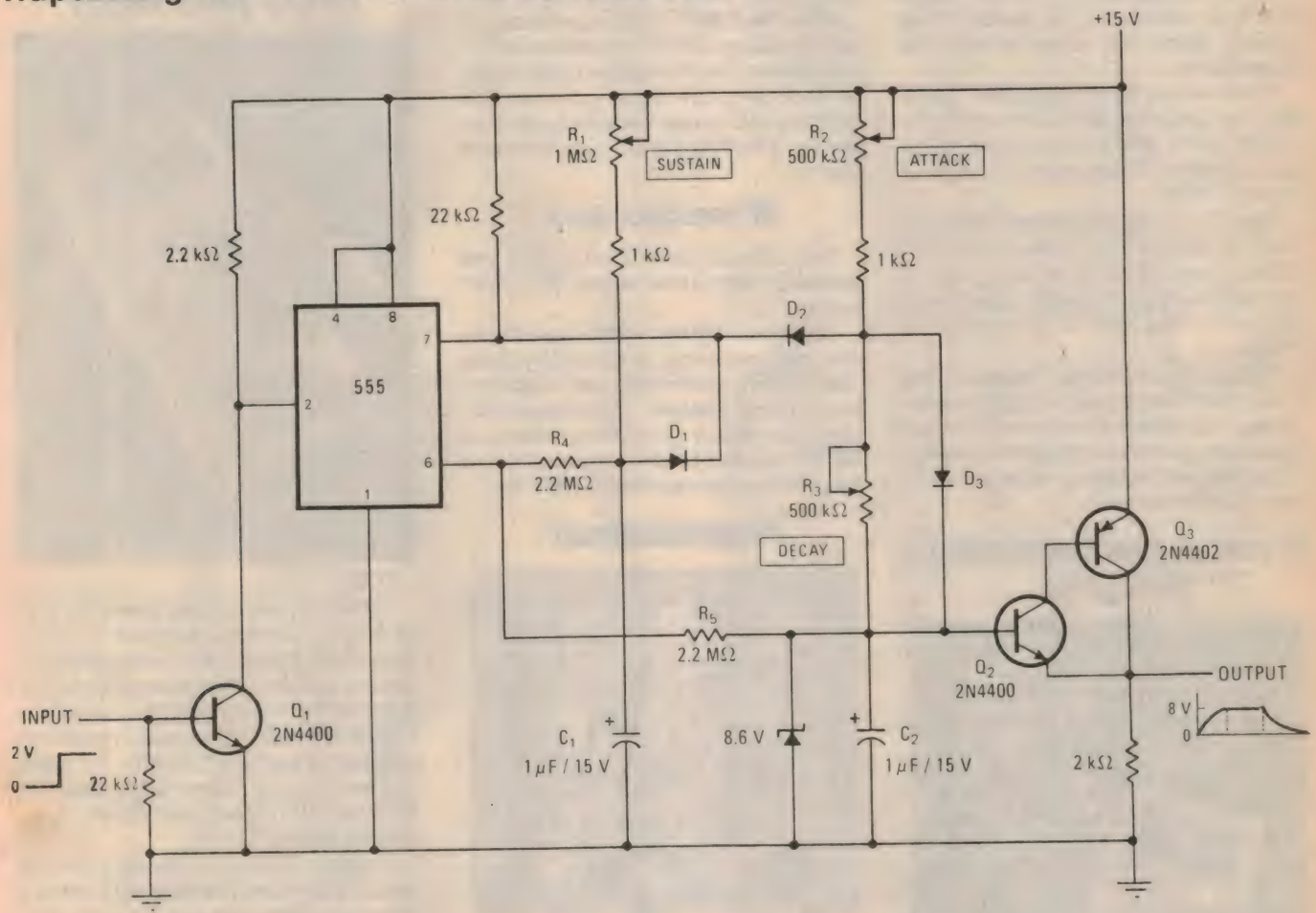
HEXADECIMAL KEYBOARD

Circuit & Design Ideas

Conducted by Ian Pogson

Interesting circuit ideas and design notes selected from technical literature, reader contributions and staff jottings. As they have not necessarily been tested in our laboratory, responsibility cannot be accepted. Your contributions are welcome, and will be paid for if used

Trapezoid generator for musical synthesisers



To build a trapezoidal waveform generator of the kind used as an envelope in electronic music synthesisers, only a 555 timer IC and a few discrete components are needed. The circuit can vary the waveform's attack, sustain and decay times over a wide range and puts out a signal with a maximum amplitude of 8V.

The three time increments, characteristic of this envelope generator, are shown near the output of the circuit diagram. Since its attack and decay signals are functions of charging capacitors, its waveform exhibits exponential rise and fall times. But linear ramps may be obtained by charging each capacitor with a constant current—a bipolar or field-effect transistor inserted in its charging circuit does the job.

Input to the circuit is a 0-to-2V positive pulse, which is compatible with most keyboard-type voltages. The RC network differentiates the pulse, and Q1 inverts it to provide the necessary negative-going trigger for the timer. Triggering the timer sets the flip-flop within the chip, and the discharge pin (7) goes high. Diodes D1 and D2, now reverse biased, permit timing capacitors C1 and C2 to charge through sustain control R1 and attack control R2, respectively. C2 ceases to charge upon reaching the breakdown voltage of the zener diode (8.6V), and this event ends the attack period, t1.

C1 continues to charge until the voltage at the threshold pin (6) of the timer, determined by the R4-R5 summing junction, reaches approximately 10V. The flip-flop within the chip is then reset, and this event ends the sustain period, t2.

Reset of the internal flip-flop drives the discharge pin (7) low, allowing C1 and C2 to discharge through forward biased diodes D1 and D2. Capacitor C2, discharging through potentiometer R3, determines the decay time period, t3. Note that R3 is shorted by D3 when C3 is charging during the attack time.

For linear ramps, the constant current sources must be placed in the R2 and R3 charging legs. However, the audible difference between linear and exponential attacks and decays of short duration is not great.

(By Roland Bitsch, in "Electronics".)

Economical process gives professional finish

Recently I developed an idea for lifting printed front panel artwork and meter scale artwork from the magazine, for use in constructional projects. I believe the idea to have considerable merit, being cheap, simple and

Why you should buy a digital multimeter from the leader in digital multimeters.

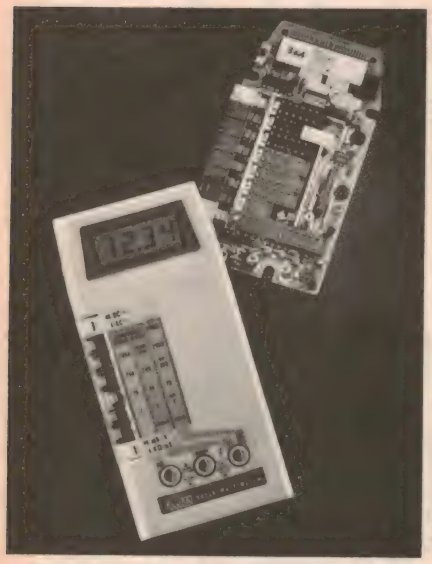
If you're shopping for your first multimeter, or moving up to digital from analog, there are a few things you should know.

First, look at more than price. You'll find, for instance, that the new Fluke 8020A DMM offers features you won't find on other DMMs at *any* price. And it's only $179.*

Second, quality pays. Fluke is recognized as the leading maker of multimeters (among other things) with a 30-year heritage of quality, excellence and value that pays off for you in the 8020A.

Third, don't under-buy. You may think that a precision 3½-digit digital multimeter is too much instrument for you right now. But considering our rapidly changing technology, you're going to need digital *yesterday*.

If you're just beginning, go digital.



Why not analog? Because the 8020A has 0.25% dc accuracy, and that's *ten times better* than most analog meters.

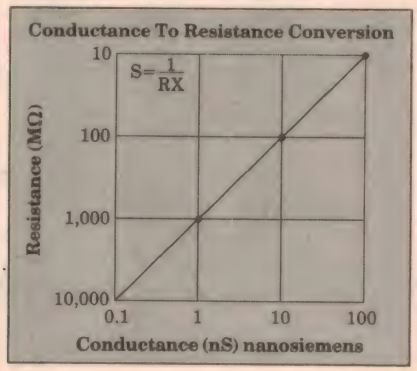
Also, the 8020A's digital performance means things like 26 ranges and seven functions. And the tougher your home projects get, the more you need the 8020A's full-range versatility and accuracy. The 8020A has it; analog meters don't.

If you're a pro.

You already know Fluke. And you probably own a benchtop-model multimeter.

Now consider the 8020A: smaller in size, but just as big in capability. Like 2000-count resolution and high-low power ohms. Autozero and autopolarity. And the 8020A is MOV-protected to 6000V against hidden transients, and has overload protection to 300V ac.

Nanosiemens?



Beginner or pro, you'll find the meter you now have can't measure nanosiemens. So what? With the 8020A *conductance* function, you can measure the equivalent of 10,000 megohms in nanosiemens. Like capacitor, circuit board and insulation leakage. And, you can check transistor gain with a simple, homemade adapter. Only with the 8020A, a 13-oz. heavyweight that goes where you go, with confidence.

What price to pay.

$179.*

Of course, you can pay more. Or less. In fact, you could pay almost as much for equally compact but more simplistic meters, and get far less versatility. And, the 8020A gives you the 'plus' of custom CMOS LSI chip design, and a minimum number of parts (47 in all). All parts and service available at more than 100 Fluke service centers, worldwide. Guaranteed, for a full year.

Rugged. Reliable. Inexpensive to own and to operate; a simple 9V battery assures continuous use for up to 200 hours.

FLUKE®

*Excluding Sales Tax

Fluke 8020A DMM for Home Electronics Experts: $179

ELMEASCO
Instruments Pty. Ltd.

P.O. Box 30, Concord, N.S.W. 2137. 736-2888
P.O. Box 107, Mt. Waverley, Vic. 3149. 233-4044
Adelaide: 426-666; Brisbane: *392-2884; Perth: 25-3144.

foolproof. I have used the idea on many occasions to produce a professional looking finish to projects which I have built.

The idea presupposes that the artwork for front panels, meter scales, etc., are printed full scale in the magazine. The procedure is as follows.

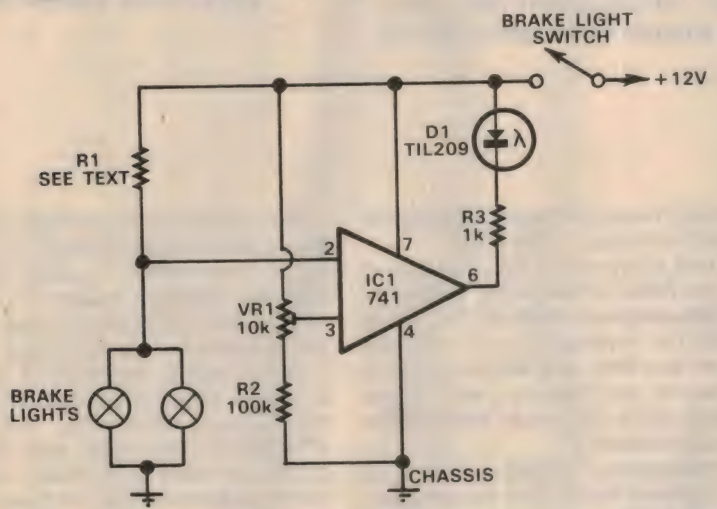
The artwork is cut from the magazine and a piece of clear "Contact" (a proprietary brand of adhesive plastic sheet selling for about 60c per metre) is stuck over the artwork. Firmly press the "Contact" onto the paper, making sure that adhesion is complete. Now immerse it in a bath of warm water and soak for several minutes.

When the paper is soft, remove it from the bath and rub the paper side until the paper is removed. A small nail brush may be used with water to remove the last remains of the paper. The print is transferred to the adhesive on the "Contact". The adhesive is not adversely affected by the process and the resultant artwork with "Contact" is ready for use when the water has dried off. It may then be stuck to the panel, meter scale, or whatever, resulting in a professional finish for just a few cents.

This process may also be useful in producing the positive for photo etching of PC boards, but I have not tried it myself.

(By Mr B. S. Beck, "Auchendarroch", Adelaide Road, Mt Barker, SA 5251.)

Brake light failure warning



The circuit has been designed for a 12V negative earth system as this is used in most modern cars. The 741 has very high gain and the output is proportional to this gain and the difference in voltage at the two inputs with respect to the negative line. Thus the output can be moved towards either supply line.

Consider two positive voltages, one applied to pin 2 and the other to pin 3. These voltages are measured with respect to the negative line. If pin 2 voltage is greater than pin 3 voltage, the output will go to the negative line potential. Under these conditions the LED turns on. If these conditions were reversed, with the voltage at the inverting input less than at the non-inverting input, the LED would remain off.

The input voltages to the operational amplifier are derived from potential dividers across the supply lines. With VR1 set to mid-position there will be about 11.5V on pin 3. The voltage at pin 2 is derived from the divider action of R1 in series with the two brake lamps (in parallel).

By choosing a suitable value for R1 it is possible to obtain a similar 11.5V or so at pin 2 with both lamps working. However, due to the potential divider action, this voltage will be higher if one lamp fails and will be the full 12V with both out of action. By adjusting VR1, a setting can be found when pin 2 voltage will be slightly less than pin 3 voltage with both lights on, but slightly greater when only one light (or both) is off. This critical setting for VR1 will be found when setting up.

It should be noted that the 0.5V drop mentioned above means that the supply to the stop lights will be reduced by this amount. This is in order and little or no difference will be noted in lamp brightness.

A calculation is needed to give the value of R1. By way of an example, many brake lamps are rated at 21 watts, giving a total of 42 watts. The current is given by (W/V) = (42/12) = 3.5A. As the voltage required across R1 is 0.5V, then R1 = (V/I) = (0.5/3.5), which is approximately 0.14 ohm. The power rating for R1 is given by W = I x V = (3.5 x 0.5) = 1.75W.

Therefore, R1 should be a 0.14 ohm resistor rated at 2W or so. Four 0.47 ohm ½W resistors in parallel will give a value of 0.12 ohm, which is near enough to the required value. R1 becomes quite warm in prolonged operation and so should be stood off from its mounting board.

The purpose of R3 is to limit the current through the LED to a safe level. Its value may be reduced to about 470 ohms if a little more brightness is required.

To adjust the circuit, switch on the ignition and press the brake pedal. VR1 is adjusted until the LED comes on. VR1 is then backed off until the LED just goes out. With one of the brake lamps removed, the LED should light.

(By T.I.R. de Vaux-Balbirnie, B. Sc., in "Everyday Electronics".)

Editorial note: We have received a letter from Mr G. Hubley, 154 Waterloo Street, Tuart Hill, WA 6060, who says that he has built up the above unit but that he used six 0.82 ohm ½W resistors in parallel, instead of the four 0.47 ohm ½W resistors as originally specified. He also used a somewhat larger LED than that specified, and he says that the complete unit has worked well and reliably.

Test message generator for data terminals

In this article we describe a test message generator, which is intended for use with teleprinters and video display terminals. The well known and internationally accepted "quick brown fox" message can be generated in either ASCII or Baudot code, with varying baud rates.

by DAVID EDWARDS

The recent upsurge of interest in microprocessors has brought with it a requirement for terminal units of one sort or another. These units use the serial asynchronous ASCII code, and can be either mechanical (e.g., the ASR 33 Teletype) or electronic (our own Video Display Terminal).

Similarly, the recent availability of surplus Baudot teleprinters has stimulated interest in RTTY operations.

Both of these activities have produced a need for a suitable test message generator, to allow testing and adjustment of both teleprinters and video terminals.

The instrument described in this article is entirely electronic in operation, and generates the message with negligible distortion. The actual message generated is shown at the top of this page.

The unit can provide this message in either the ASCII or BAUDOT code, and at the following baud rates: 45, 50, 75, 110 and 300. The message can be sent one character at a time, one line at a time or continuously (Leo Simpson, who works next to me in the lab, would term this last mode ad nauseam!).

This message is provided at the output in two different forms. The first of these is a standard 20mA current loop signal, as is used by the majority of low-cost terminals, while the second is an uncommitted logic output, which can be configured to drive TTL, CMOS and other logic families, as well as being adaptable to other possible requirements.

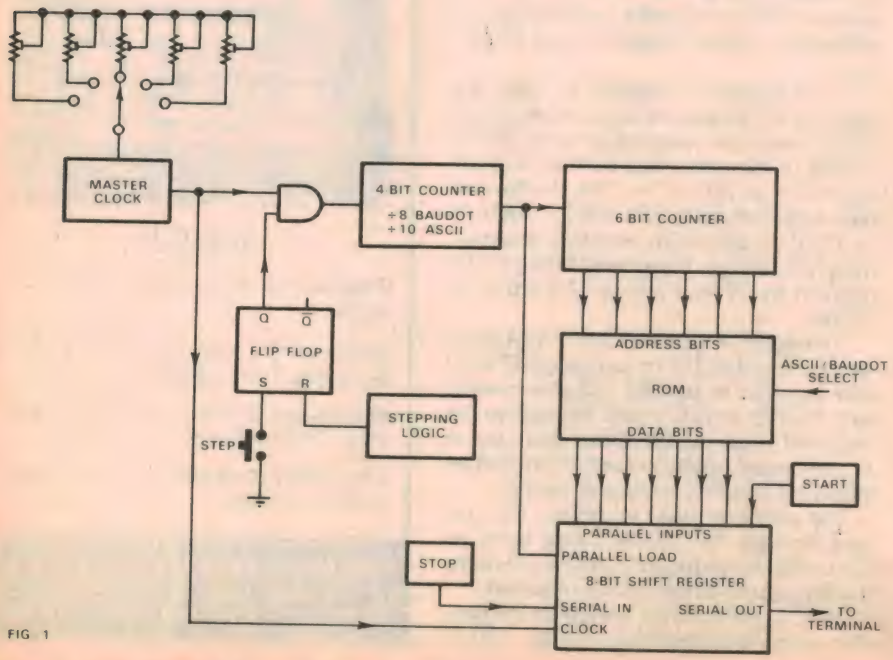


FIG. 1

This diagram shows the way in which the code message is extracted from the ROM.

The unit is mains powered, and is constructed on a single printed circuit board (PCB). It is housed in a small utility case, with the different modes of operation being selected by three rotary switches and a momentary action toggle switch.

Electronically, the heart of the unit is a special National Semiconductor read only memory (ROM). The MM5220DF is a 1024-bit static read only memory, produced using a P-channel enhancement mode monolithic MOS technology, It is mask programmed during manufacture, and is organised as 128 8-bit words.

Turning now to Fig. 1, we can discuss how the codes are extracted from the ROM. The logic to do this has been implemented using CMOS logic, as this is directly compatible with the ROM chip itself. All of the devices used are readily available 4000 series or 74C series chips.

The master clock has five selectable rates, and runs at the equivalent of the baud rate expressed in Hz. Thus to generate the test message at 50 baud, the clock is adjusted for 50Hz operation.

The master clock signals are applied to a 4-bit counter, programmed to divide by either 8 or 10, for either Baudot or ASCII character timing respectively. The output of this counter is thus a train of pulses at the required character repetition rate.

To be strictly correct, the division ratio for the Baudot message should be 7½, to give the required "1½ stop bit" timing. Such a ratio is technically difficult to achieve, so we have compromised with a ratio of 8. This gives 2 stop bits instead of 1½, the only effect of which is to increase character spacing slightly.

The output from the 4-bit counter is used to clock a 6-bit binary counter, whose output drive the address lines of the ROM. Thus a new character is presented at the ROM outputs every 8 or 10 master clock pulses.

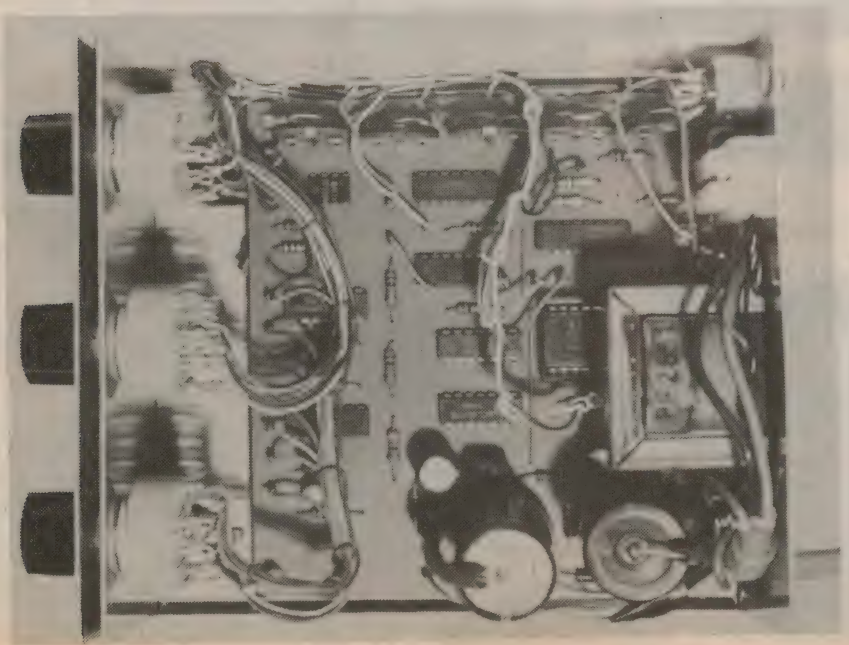
The ROM outputs are connected to the parallel load inputs of an 8-bit shift register, which is clocked serially by the master clock pulses. Just after a new character appears at these inputs, it is loaded into the register by pulsing the parallel load input.

This loading occurs synchronously with the register clock pulse, so that there are no glitches at the serial output of the register. A logic level corresponding to a start bit is loaded into the last stage of the register (i.e., the first stage to be clocked out the serial output), with the seven data bits from the ROM loaded into the remaining stages.

A logic level corresponding to a stop bit is applied to the serial input, so that after the last bit of the character has been shifted out, stop bits will follow. In the Baudot mode, the sixth and seventh outputs from the ROM are arranged to be stop bits, so that stop bits are obtained after the five data bits.

Having stop bits applied to the serial input at all times ensures that when in the single character and single line modes, stop bits are transmitted continuously during the breaks in the message.

An RS flip flop is used to control the operating mode of the message generator. In the continuous mode, the flip flop



This photograph of the interior of the prototype will aid in the assembly of your unit.

PARTS LIST

SEMICONDUCTORS
1 MM5220DF ROM (quick brown fox generator)
4 4011 quad gates
1 4014 8-bit static shift register
1 4024 7-bit binary counter
1 74C93 4-bit binary counter
1 555 timer
2 EM401 silicon power diodes
2 12V 1W zener diodes

CAPACITORS
2 2500uF 25VW PCB or axial electrolytics
2 100uF 16VW PCB electrolytics
1 4.7uF 35VW tantalum electrolytic
3 0.1uF polyester
1 0.047uF polyester
3 0.01uF polyester

RESISTORS (all ½W)
7 1M, 1 33k, 5 10k, 1 1.5k, 2 470 ohm, 2 47 ohm

TRIMPOTS (all 0.2" lead spacing)
2 470k, 1 220k, 1 100k, 1 47k

SWITCHES
1 5 position 1 pole rotary
1 3 position 2 pole rotary (non shorting)
1 2 position 4 pole rotary
3 knobs to suit
1 SPST (changeover) momentary contact miniature toggle
1 SPST miniature toggle

MISCELLANEOUS
1 printed circuit board, coded 77qbf7, 120 x 112mm
1 case, 76 x 134 x 150mm
1 mains transformer, 12.6V @ 150mA, PF 2851, DSE 2851 or similar
1 mains cord, plug, grommet, cord clamp and terminal block
1 output connector (see text)

4 9.5mm (3/8") PCB STANDOFFS
Solder, coloured hookup wire (rainbow cable), circuit board pins, tinned copper wire, machine screws and nuts

NOTE: Resistor wattage ratings and capacitor voltage ratings are those used for our prototype. Components with high ratings may generally be used provided they are physically compatible.

TEL

OS 115= JJ65 =

SYDNEY NSW 10 3.50P

TEXAS INSTRUMENTS INCORPORATED

BOX 5012

DALLAS TEXAS 7522

CEMA

21 CHANDOS STREET

CROWS NEST NSW AUST 2065

CONFIRMATION. CEMA APPOINTED JULY 1ST

1977 T.I. DISTRIBUTORS FOR AUSTRALIA.

CONGRATULATIONS.

(620 T.I.) 15

TELEGRAM

RAM

Texas Instruments stock now available.
Silicon Power, Thyristors, Optoelectronics,
T.T.L., Schottky and low power Schottky.
Memories: — MOS, Bipolar, PROM, EROM.
Cema Australia's specialty semiconductor
distributors.

CEMA

CEMA ELECTRONICS PTY LTD

SYDNEY:
21 Chandos Street,
Crows Nest, N.S.W. 2065
Phone: 439-4655

MELBOURNE:
208 Whitehorse Road, Blackburn,
Victoria, 3130. Phone: 877-5311
BRISBANE:
Electronic Components (QLD) —
371-5677
CANBERRA:
Custom Scientific — 82-3581
ADELAIDE:
Protronics Pty. Ltd. — 51-4713
PERTH:
Reserve Electronics — 87-1026
WOLLONGONG:
Macelec — 29-1276

remains set, and enables the 4-bit counter continuously. In the other modes, the stepping logic resets the flip flop at the appropriate time, stopping the master clock pulses from reaching the 4-bit counter. The step button is then used to initiate another character or line of the message.

Fig. 2 shows the complete circuit of the message generator. Four quad gates are used to implement the stepping logic and RS flip flop, as well as other housekeeping functions such as debouncing the step switch and resetting the 4-bit counter at the appropriate times.

Note the six inverters formed from further gates, used to invert the address lines of the ROM, and the two sections of the ASCII/BAUDOT switch used to connect the seventh and eighth inputs of the shift register to high logic levels in the Baudot position. These "extras" are required because the ROM is programmed with negative logic.

Output interfacing to the terminal is provided by two BC548 transistors. One provides a 20mA current loop signal, while the other has an uncommitted collector, and can be used to interface to other logic systems.

In order to avoid problems with earth loops, the circuitry of the unit is not earthed. It is intended to be earthed via the connection to the terminal.

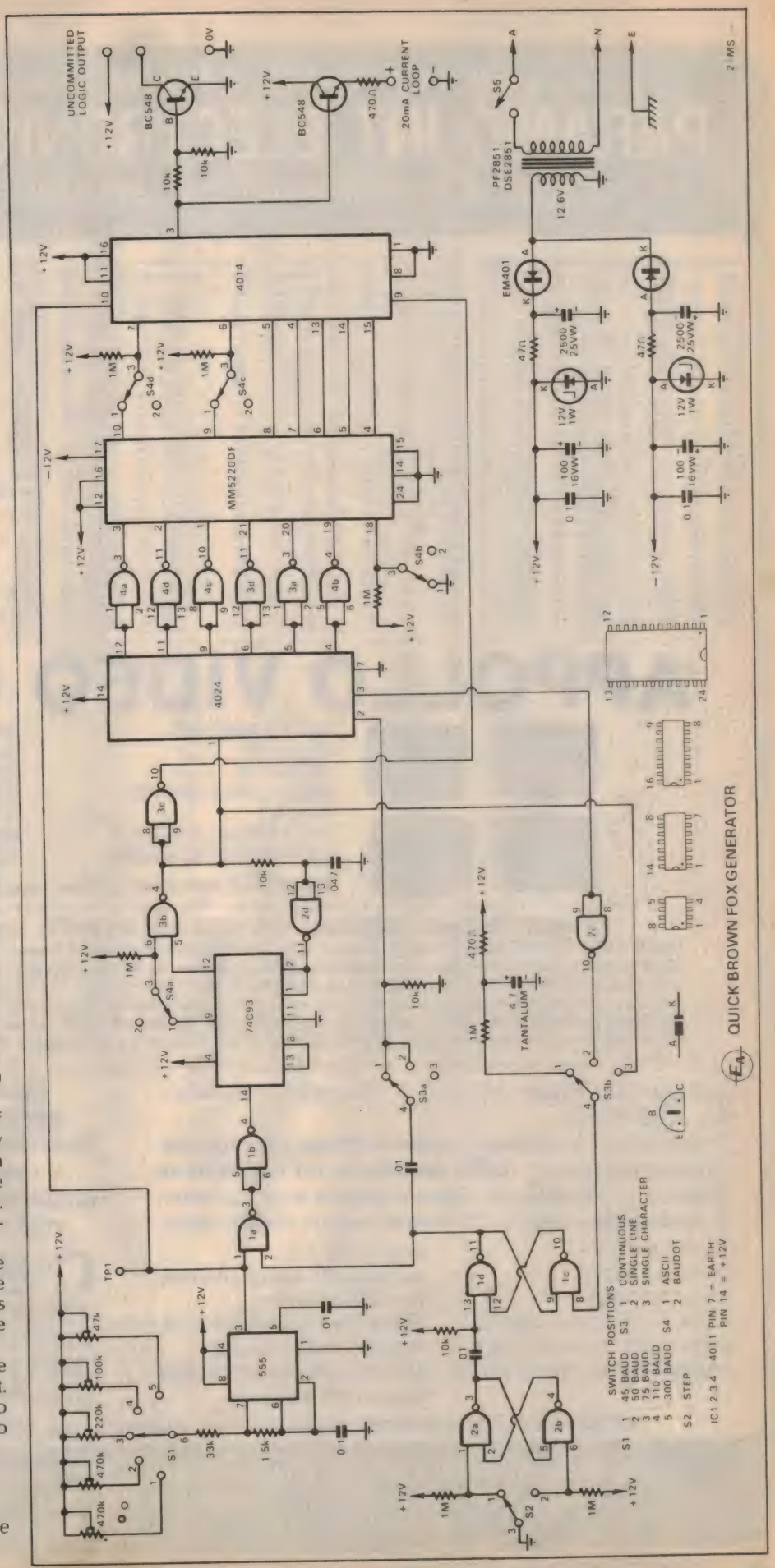
A simple zener stabilized power supply has been incorporated on the PCB. Thus power requirements for the board are simply 12.6VAC. Suitable transformers have been specified in the parts list and on the circuit diagram.

Construction of the unit should be well within the capabilities of most experienced constructors. All components apart from the switches and transformer are mounted on a single printed circuit board, coded 77qbf7, and measuring 120 x 112mm.

In order to minimise the number of links on the board, we have used very thin tracks, with correspondingly thin spaces between tracks. Use a very fine pointed soldering iron, and fine solder. We have found that 0.71mm dia. five-core solder is adequate for the job.

A total of 31 circuit board pins are required, as well as three links. We recommend the use of pins with this board in order to reduce the strain on the copper tracks.

Due to its cost we recommend that the ROM be fitted to the board via a socket. This should be a good quality one, to minimise the risk of faulty joints. We do



This is the circuit diagram of the complete test message generator.

ANNOUNCING NORTH SHORE'S NEWEST DEALER

PARAMOUNT ELECTRONIC SERVICES

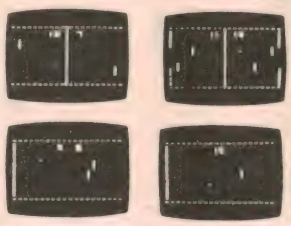
(A DIVISION OF PARAMOUNT COLOUR ENGINEERING PTY. LTD.)

POPULAR INTEGRATED CIRCUITS IN STOCK

CD4000	55	CD4042	1 95	CD4518	2 85	LM318N	5 90	LM5628	10 90	74C14	2 80	MA1002	13 50	7805CP	2 90	7824CP	—	82S23	6 95	74LS109	85	BC107	35
CD4001	55	CD4043	2 25	CD4519	1 35	LM319H	7 25	LM566CN	2 50	74C20	75	POPULAR SEMI-CONDUCTORS						8281A	0 90	74LS113	85	BC108	35
CD4002	55	CD4044	2 25	CD4520	2 55	LM319N	5 90	LM567CN	3 50	74C85	3 90							BZY90	7 50	74LS114	85	BC109	35
CD4006	2 30	0C4045	3 20	CD4528	1 80	LM320K	6 90	LM709N	95	74C86	2 00	STOCKED						74LS00	55	74LS151	2 60	BC177	40
CD4007	55	CD4046	3 20	CD4539	1 98	LM320T	4 50	LM710CN	1 25	74C90	2 50	7400	48	7447	2 60	74132	1 90	74LS01	55	74LS153		BC178	40
CD4008	2 35	CD4047	1 95	CD4555	1 80	LM322N	4 50	LM710CH		74C154	5 70	7401	48	7448	2 60	74141	2 75	74LS02	55	74LS157	2 40	BC179	40
CD4009	1 50	CD4049	90	CD4556	1 80	LM323K	7 90	LM710CH		74C160	3 60	7402	48	7450	48	74145	2 95	74LS03	55	74LS163	3 95	BC182	40
CD4010	1 50	CD4050	90	CD4720	12 60	LM324N	4 50	LM723N	1 70	74C162	4 50	7403	48	7451	48	74150	3 25	74LS04	65	74LS163	3 95	BC212	50
CD4011	55	CD4051	2 25	CD4724	3 85	LM325N	4 50	LM723N	1 25	74C174	2 50	7404	48	7453	48	74151	2 20	74LS08	55	75LS164	2 90	BC327	55
CD4012	55	CD4052	2 25	CD40097	1 80	LM326H	4 50	LM725N	5 90	74C192	2 60	7405	48	7454	48	74153	1 95	74LS09	55	74LS174	2 70	BC337	55
CD4013	90	CD4053	2 25	CD40098	1 80	LM339N	3 70	LM733CH	2 70	74C901	1 95	7406	1 09	7470	85	74157	2 20	74LS10	60	74LS175	2 70	BC547	55
CD4014	2 40	CD4066	1 45	CD40174	2 90	LM340K	4 95	LM733N	2 50	74C925	16 70	7407	1 09	7472	75	74160	2 75	74LS11	55	74LS181	6 50	BC548	55
CD4015	2 40	CD4068	55	CD40175	2 90	LM340T	2 70	LM741CH	1 20	80C95	2 20	7408	1 09	7473	80	74164	2 90	74LS13	1 20	74LS191	4 50	BC549C	55
CD4016	90	CD4069	60	CD40192	2 90	LM349N	4 50	LM741CN	75	MISC		7409	48	7474	95	74165	2 90	74LS14	2 95	74LS192	4 50	BC559	55
CD4017	2 25	CD4070	55	CD40194	2 90	LM358N	3 20	LM747CH	2 70	AL5352	1 50	7410	48	7475	1 35	74174	2 90	74LS20	55	74LS193	4 50	BC639	1 20
CD4018	2 25	CD4071	55	CD40195	2 90	LM370H	4 95	LM747CN	2 50	GL4484	1 80	7411	54	7476	90	74180	2 90	74LS21	55	74LS194	2 60	BC640	1 20
CD4019	2 25	CD4072	55	OM8097	1 90	LM371N	3 90	LM748CN	1 20	GL5253	90	7413	1 15	7480	1 60	74181	5 95	74LS22		74LS195	2 60	BD131	1 20
CD4020	2 50	CD4075	55	HEF see	'CD	LM372H	7 50	LM1303N	2 60	OL31	90	7414	2 70	7482	2 30	74185	4 90	74LS27	60	74LS196	2 60	BD132	1 60
CD4021	2 25	CD4076	1 25	LH0070	6 20	LM372N	4 50	LM1310N	3 50	RL4484	39	7416	1 00	7483	2 30	74190	3 20	74LS28	60	74LS221	2 50	BD139	1 20
CD4022	2 15	CD4078	55	LM114H	4 90	LM373N	4 70	LM1458N	2 50	RL5023	35	7417	1 15	7485	2 95	74177	2 90	74LS30	55	74LS253	2 75	BD140	1 20
CD4023	55	CD4081	55	LM301AN	95	LM374N	4 90	LM1488N	6 90	FND357	3 50	7420	48	7486	85	74191	2 90	74LS32	70			BD237	1 80
CD4024	1 75	CD4082	55	LM301CN	95	LM375N	4 90	LM1489N	5 75	FND500	3 50	7422	1 95	7489	4 50	74192	2 75	74LS37	70	SEMICONDS		BD238	1 80
CD4025	55	CD4085	1 65	LM304H	3 80	LM377N	3 50	LM1496N	1 90	9001	1 80	7425	95	7490	90	74193	2 75	74LS38	70	AC125	1 80	BD437	2 80
CD4026	3 30	CD4086	1 65	LM305AH	3 80	LM379	7 50	LM1808N	3 90	9368	3 85	7426	70	7491	1 90	74194	2 50	74LS40	65	AC126	1 80	BD438	2 90
CD4027	1 05	CD4093	1 80	LM307N	1 60	LM380N	2 75	LM3028	CA3028	9601	2 90	7427	66	7492	1 20	74195	1 90	74LS42	2 20	AC127	1 80	BF173	1 25
CD4028	1 80	CD4502	2 70	LM308V	2 20	LM381N	3 20	LM3046	3 60	NSN71	2 90	7430	48	7493	1 20	74196	2 90	74LS73	75	AC128	1 80	BF180	1 20
CD4029	2 65	CD4503	1 40	LM309K	2 60	LM382N	2 60	LM3086	3 75	NSN74	2 90	7432	66	7494	2 20	74S00	1 50	74LS74	90	AC132	1 50	BF194	85
CD4030	95	CD4510	3 20	LM310N	3 90	LM387N	2 75	LM3900	1 75	TIL306A	13 80	7437	90	7495	1 65	74S10	1 75	74LS75	1 20	AC187	1 50	BF200	1 30
CD4031	4 70	CD4511	3 30	LM311A	3 60	LM395K	6 90	LM3905	3 90	11C90	18 50	7438	90	7496	2 15	74S20	1 75	74LS78	75	AC188	1 50	BFY50	1 20
CD4035	2 35	CD4514	6 50	LM311H	3 60	LM555CN	1 20	LM3909	1 50	95H90	14 50	7440	48	74100	3 65	74S74	3 50	74LS86	95	AD149	2 60	BFY51	1 50
CD4040	2 50	CD4515	6 50	LM312H	4 90	LM555H	1 95	74C00	55	2102.2	3 75	7441	2 80	74107	95	74S112	3 20	74LS90	1 95	AD161/62	4 50	BPX25	4 90
CD4041	2 50	CD4516	3 20	LM317K	6 90	LM558N	2 95	74C02	80	2513N	17 50	7442	2 60	74121	1 20	74S251	5 30	74LS92	1 95	AS322	18	BSX19	75
								74C04	55	S1883		7445	2 60	74122	1 20	74S258	4 75	74LS93	1 95	AT1138	2N301	BU126	3 85
								74C10	65	S50242	15 00	7446	2 60	74123	1 40	74S196	7 50	74LS95	2 60	ASY17	2 85	MFE131	1 95

2N3569	50	40673	1 95				
2N3638	55	40822	2 90				
2N3638A	60	40841	1 90				
2N3642	55	BZX61	75				
2N3643	55	BZX79	42				
2N3694	65	BZX70	1 50				
2N3731	5 95	BZY93	2 60				
2N3819	1 35	BZY91	12 50				
2N3868	2 75	PA40	5 85				
2N4037	1 25	PB60	6 50				
2N4249	65	MEL12	1 40				
2N4250	65	FCD820	1 90				
2N4355	65						
2N4356	65						
2N4360	95						
2N5245	75						
2N5457	MPF103						
2N5458	MPF104						
2N5459	MPF105						
2N5485	MPF106						
2N5590	MRF603						
2N5591	11 30						
2N6027	1 35						
2N6084	21 00						
2SC799	5 50						
2SC1306	5 50						
2SC1307	5 50						
8A102	80						
0A47	60						
0A90	35						
0A91	35						
5082-2800	3 20						
40440	2N3731						
40637A	2 85						

APPOLLO VIDEO GAMES



BLACK & WHITE KIT	$52-50
ETI 804 KIT	$52-50
COLOUR KIT	$84-50
COLOUR PROCESSOR KIT	$36-50
RIFLE KIT	$25-00
FULLY ASSEMBLED B & W	$66-50
FULLY ASSEMBLED COLOUR	$99-00

P&P INCL.
See February issue
for full details

Manufactured units include AC Battery Adaptor . . . not included in kits.

NEW RELEASE: NATIONAL MA 1003 12V DC AUTO. CLOCK MODULE

The MA1003 12V DC auto instrument has a 4 digit D.3 inch green fluorescent display. The module is transient protected and also against battery reversal. Time-keeping is maintained down to 9V DC. Display is blank when ignition is off, reduces brightness to 33% with park or headlamps on and follows dash lamp dimmer. The display features leading zero blanking and has a blinking colon activity indicator. Time setting is accomplished by closing switches, and these are disabled when the display is blanked preventing tampering, the display may be activated with ignition off by closing a display switch. Full installation instructions included. **$26.50** & $1.00 P & P. Also connector available. $1.50.

Announcing Kraco AM S.S.B. Transceiver Module No. KCB2340.

This deluxe Transceiver is styled to please the most discriminating buyer. With chrome front escutcheon & wood grain cabinet. Specifications and features: 4 watts output (AM), 12 watts output (SSB)—pep.

DELTATUNE (AM)
NOISE BLANKER
PUBLIC ADDRESS
SIGNAL—POWER SRS METER
SENSITIVITY .25 MICROVOLT —10dB SIGNAL—NOISE RATIO
CLARIFIER (S.B.)
AUTOMATIC NOISE LIMITER
RS GAIN CONTROL
EXTENSION SPEAKER SOCKET
ACCESSORIES INCLUDE MICROPHONE POWER LEAD & MOUNTING BRACKET.

CB RADIO REPAIR SERVICE SPECIALISING ON IMPORTED UNITS ON MOST IMPORTED RIGS

FULL RANGE OF PASSIVE COMPONENTS CARRIED AT ALL TIMES

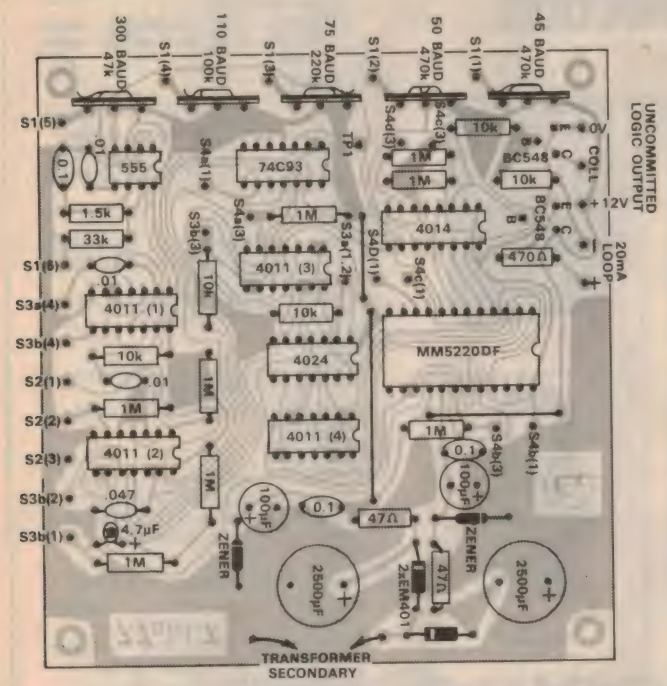
FULL PRICE $246 . . . $6. P & P.

C B RADIOS

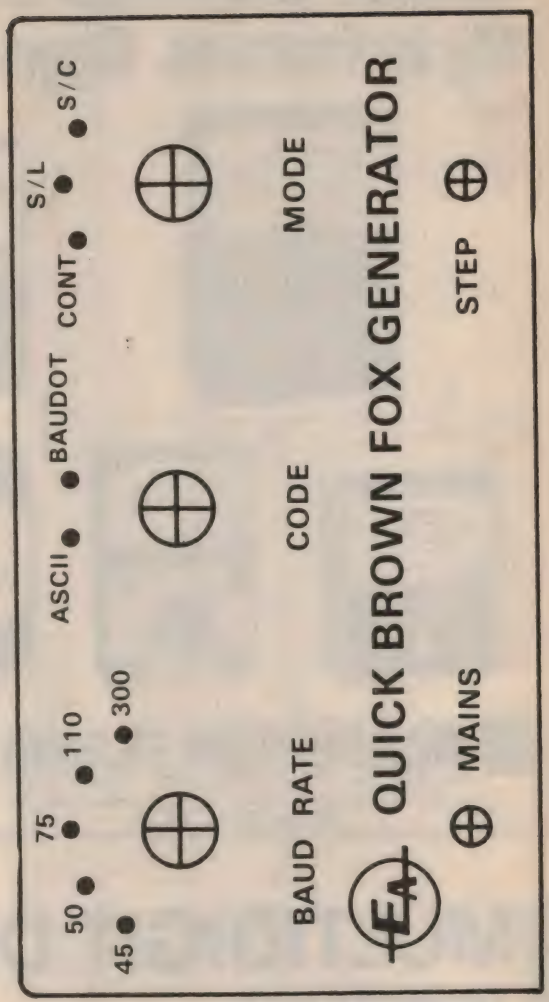
FROM $49-00 OUR SELECTION
ELECTROPHONE C B 235
JUST LOOK AT THESE SPECS.
OUR PRICE $129.00

A GOOD RANGE OF C B ACCESSORIES IN STOCK. CURRENT ETI & EA KITS ALSO AVAILABLE.

NOTE OUR NEW ADDRESS: 47-49 JERSEY STREET, HORNSBY. N.S.W. 2077
MAIL ORDER: P.O. Box 301, HORNSBY. N.S.W. 2077 PHONE: 476-5911
MON. — FRI. 9.00 to 5.30 SAT. 8.30 to NOON



ABOVE: Use this overlay diagram to aid the placement of components on the printed circuit board. The CMOS devices are fitted only after all other components, including switches, have been soldered into place.



RIGHT: This photograph of the front panel is actual sized, so that it can be either used direct, or traced. Dyeline transparencies of the pattern are available from our Information Services.

not recommend sockets for the remaining devices, on the grounds of expense and reliability. Provided care is taken, we have found that CMOS devices can be successfully soldered into circuits.

We mounted the prototype in a small case measuring 76 x 134 x 150mm, kindly supplied by Dick Smith Electronics Pty. Ltd. This has an aluminium base and a steel cover, and is supplied complete with rubber mounting feet.

The front panel of the prototype was made using "Scotchcal" photosensitive aluminium. We have reproduced the artwork required full size. Dyeline transparencies will also be available from our Information Service. If desired, lettering can be applied to the front of the case using pressure sensitive lettering, protected with a coat of clear lacquer.

The three rotary and two miniature toggle switches were supplied by C & K Electronics (Aust) Pty. Ltd. Similar switches should be avaliable at your components supplier.

We have left the choice of a suitable output connector up to the individual constructor. On the prototype, we used a six pin 270 degree DIN socket, as this matched with the system used on our earlier terminal projects.

Commence construction by fitting all the hardware to the case. Use the photographs as a guide. The PCB is mounted towards the rear of the case, using 9.5mm (3/8") PCB standoffs, to allow clearance at the front for the toggle switches. The transformer is mounted on the rear of the chassis, along with the mains terminating block and cord clamp.

The mains cord enters through a grommetted hole, and is then clamped to the case. The active and neutral leads run directly to the terminating block, with the earth lead securely connected to the chassis via a solder lug.

Use the reproduction of the front panel given with the article as a guide to the placement of the switches. Once they have all been fitted, remove the PCB, and commence to fit the remaining components to it.

Fit all the passive components, the 555, the output transistors and the 24 pin socket to the board at this stage, but do not at this stage fit any of the MOS devices, or even remove them from their protective wrapping.

Now refit the PCB to the case, and, using rainbow cable or similar hookup wire, complete all the wiring to the switches, but not to the transformer or output socket.

After tying all the wiring into a neat loom, remove the PCB and the switches from the case, and prepare to fit the remaining MOS devices. Earth the barrel of your soldering iron to the earth pattern

Sanwa precision circuit testers–
Big on features. Bigger on selection.

1


2


3


4

5


6


7

1. BX-505
- Fast-response, 24μA movement – fuse & diode protected with high resolution factor (0.4μA/scale division)
- Revised scale marking – intermediate readings readily determined

2. U-60D
- 44μA movement – quality performance, diode protected
- Stable ACV measurement – solid-state rectifier & enlarged frequency coverage

3. SP-10D
- Easy operation – multiposition rotary selector switch & well-lighted scale
- Stable ACV measurement – durable diode rectifier

4. N-501
- 2μA suspension movement – 0.05mA/1mV resolution
- Double protection – fuse & Si diode

5. CX-505
- 16.5μA movement – varistor protected & 50kΩ/V for DC
- Capacitor tester – push-button operation with solid-state oscillator built in

6. PDM-500 *(Insulation Tester)*
- Battery operated – 3 small-size 1.5V batteries built in
- Push-button operation – pointer calibration & insulation test

7. CAM-201S *(Clamp Meter)*
- Measuring ranges 15-60-300A – 500V – 50kΩ
- Meter protection diode provided

WARBURTON FRANKI
ADELAIDE 356-7333 BRISBANE 52-7255 HOBART 23-1841
MELBOURNE 699-4999 PERTH 65-7000 SYDNEY 648-1711
WELLINGTON, N.Z. 698-272

sanwa MULTITESTERS

MULTIDIGIT DISPLAYS/COUNTERS

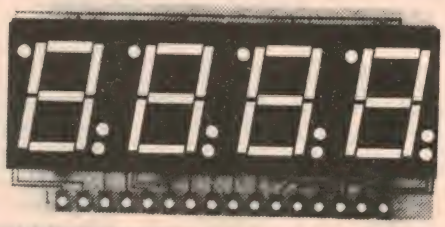
COUNTER KITS
USING NATIONAL CMOS 4 DIGIT/DECADE COUNTER-DRIVER, Multiplexed output. End stackable to infinity in 4 digit groups, with carry out, reset zero, latch. All on single modular board interfacing directly at right angles to bottom of display, giving single unit 4 digit counter for + 5 Volt supply with choice of .3" or .5" displays. Max input frequency 2MHZ and TTL compatable.—Would need another page to explain so if in doubt send SAE for Data/description.

CK10;
74C926—Straight 4 decade with carry out.

CK20;
74C927—Second most significant digit ÷ 6, i.e. 10HZ in gives count to 9 minutes 59.9 seconds. Team with CK10 for 99,999 minutes 59.9 seconds or 9 minutes 59.99999 seconds.

Techniparts 10HZ Crystal time base to suit $8.00.

PRICES;
CK10 and CK20 counter module kits complete; with NSB 3881 Display $22.00; with NSB 5881 Display $23.00.



LED DISPLAYS All displays end stackable.

4 DIGIT MULTIPLEXED COMMON CATHODE	NSB3881	.3"	$8.00
	NSB5881	.5"	$9.00
	NSB7881	.7"	$10.50
2 DIGIT MULTIPLEXED COMMON CATHODE	NSB381	.3"	$4.00
	NSB581	.5"	$4.50
	NSB781	.7"	$5.25
2 DIGIT COMMON CATHODE DIRECT DRIVE	NSB583	.5"	$4.50
	NSB783	.7"	$5.25

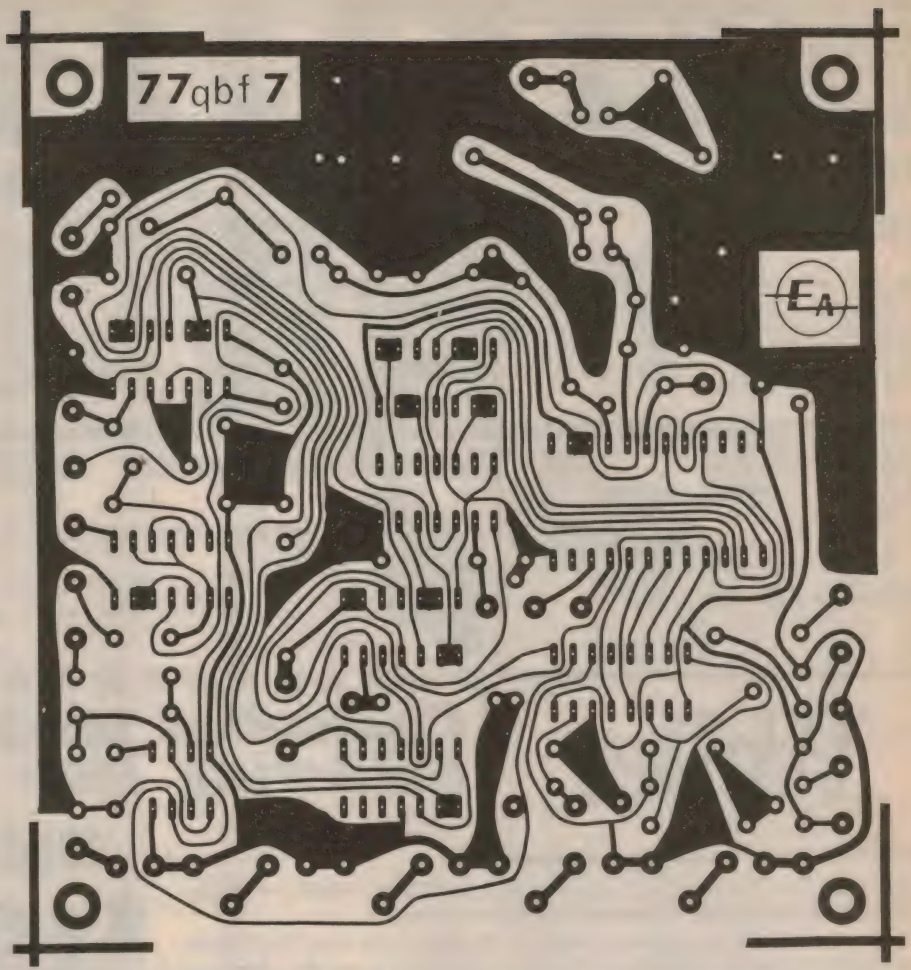
Data supplied with each purchase.

ALL PRICES INCLUDE POSTAGE

TECHNI PARTS
Woolworths Arcade,
95 Latrobe Terrace,
PADDINGTON. 4064
P.O. Box 118,
PADDINGTON. 4064
Ph: Brisbane (07) 36 1474
Trading Hours (8.30am – 5.00pm Mon. - Fri., 8.00am – 11.15am Sat.)

Message Generator

Here is an actual sized reproduction of the printed circuit board upon which most of the components are mounted.



of the board, and then mount the ICs into the board—one at a time.

Solder the power supply pins first (4 and 11 for the 74C93, 8 and 16 for the 4014, and 7 and 14 for the remainder), and then solder the remaining pins. Take care to ensure that connections are made to the tracks on both sides of the IC pins where necessary, and that you do not make any solder bridges.

When all the ICs have been soldered in this way, carefully unwrap the ROM, and plug it into the socket. Visually recheck the board for correct orientation of ICs, and also for solder bridges and similar mistakes, and then fit it back into the chassis.

With the iron still earthed to the board, complete the remaining connections to the transformer and the output socket, and then prepare to test the completed unit. You will need a terminal and a means of accurately measuring frequencies. A counter is ideal, but other means can be used if necessary.

Connect the counter to TP1 (there should be a circuit board pin there), and with the baud rate switch in the appropriate positions, adjust the five trimpots. Then, select the appropriate rate for your terminal, and connect up to it. With the mode switch in the continuous position, switch the power on.

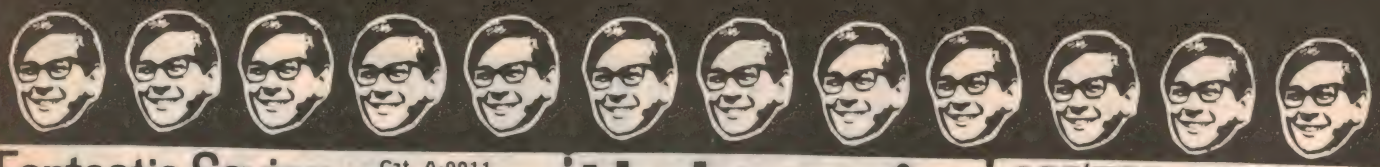
Nothing should happen. Depress the step switch, and "quick brown foxes" should appear endlessly on the terminal. The message you should see is reproduced in the heading at the start of the article.

Now switch to single line mode. The line being typed while you do this may or may not be finished. This is normal. But when you operate the step switch, one complete line should be typed out.

Then switch to single character mode. When the step switch is depressed, the first letter of the message should appear. Further depressions should produce further letters.

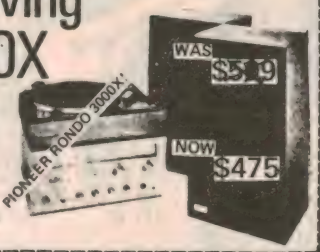
If your generator does not work as desired, the fault is most likely to be in either the switch wiring or the soldering. Check carefully that all wiring is as per the diagrams, and that there are no solder bridges or other mechanical faults.

Finally, in conclusion, we would like to point out that the letters DE at the end of the message bear no relation to the writer's initials. In fact, they are an abreviation for "from", so that a call sign or signal message can be inserted after the message.



Fantastic Saving Rondo 3000X

Cat. A-0011



- Stereo receiver with around 18 watts per channel.
- Belt drive turntable complete with base, cover and magnetic cartridge.
- Well designed 3 way speaker system
- All units are matched in every way-electronically and asthetically.
- This price will never be repeated again.

Ideal extension SPEAKER

ABSOLUTELY FANTASTIC VALUE! You probably can't believe the price! These are absolutely ideal for 4 channel add-ons, or for extension speakers. They have an attractive walnut vinyl finish, with a high compliance woofer and an exposed horn tweeter. 60Hz — 16,000Hz response, handles 10W @ 8 ohms imp.

Cat. A-2462 .. .. .. $12.50 ea.

SAVE $5.00 EACH!

AM/FM TUNER

Here is the greatest tuner value you will ever see! Specifically made for Australia with 50uS de-emphasis (not 75uS as used overseas). Has built-in ferrite antenna for AM, too. Covers FULL Australian FM and AM band — not sections of it as many imported tuners do.
Has provision for tuning meter and indicator light (stereo). Operates from 12V @ 22mA. Highly recommended at our fantastic price.

All you need do is add a case and a scale — and that's it.

Cat. F-4615 .. .. $37.50

QUALITY TESTED TAPE FROM $2.00

We believe these are BETTER than Hitachi UD or TDK SD, etc. Try them!

and just look at the prices....

C60 LN	Cat C-3350	Each: $2.00	Eleven or more: $1.50
C90 LN	Cat C-3352	Each: $2.50	Eleven or more: $1.99
C90 UD	Cat C3354	Each: $3.00	Eleven or more: $2.50

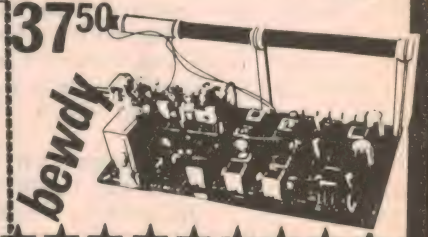
New Dome Tweeter $9.50

For those who choose the dome tweeter transducer in principle - this is the one for you! Ultra wide dispersion easily into the 20kHZ region.
- 20 watt max power handling (ideal for 80 watt systems) - ultra smooth response - ready availability.

Another excellent choice to augment our C-2610 8" enclosure! - or use in the Playmaster systems if you so desire.

Cat. C-2004 .. .. $9.50

37.50



Weller

Controlled temperature Soldering Iron

Cat. T-1000

ONLY $49.90

If you want to do a good job, you choose a good tool — and the Weller Controlled Temperature Soldering Iron is such a tool.
It's important to have the correct heat at the bit of the iron. Most irons have too high a bit temperature so when soldering is done the iron doesn't cool down too much. As well as wasting power and bits, this is dangerous for many components. Other irons have around the right temperature at the bit, but cannot cope when called upon to use some of their stored heat to solder.

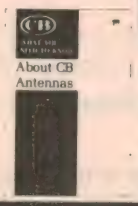
The Weller TCP-1 monitors the temperature at the bit. If more heat is needed, it supplies it — but never too much to waste energy, waste the bit or damage components. It makes sense, doesn't it?

Spare tips available

New Books!

EA Logbooks — for all radio operators: Ideal for amateurs, short wave operators, and now CBers. There is no requirement for CBers to keep a log, but you can protect yourself against TVI claims if you have one! Room for thousands of entries.

Cat. B-2258 .. .. $2.95



Big dummy's guide to CB radio Everything you wanted to know but were afraid you'd be busted if you asked! Buying & installing, power, modulation & SWR, antennas, etc etc. Complete!

Cat. B-2328 .. .. $3.95

All about CB antennas . . . Fascinating subject — one which most CBers want to know. From the same stable as 'CB Magazine'. Really authoritative and comprehensive. Cat B-2326 .. . $3.00

Ham notebook, vol. 1 Literally hundreds & hundreds of ideas from the pages of 'ham radio' magazine. Hints & kinks, data, etc for every amateur. Ideas you've probably never thought of!

Cat. B-2282 .. ..$4.75

Ham notebook. vol. 2 More of the above — much more! 11 chapters plus a comprehensive index make this one of the handiest books you can have around the shack.

Cat. B-2284 .. ..$4.95

I'm not for sale yet!

DSE62EA87

DICK SMITH ELECTRONICS GROUP

VISIT YOUR NEAREST BRANCH:
SYDNEY — 125 York St. Ph 29-1126
BANKSTOWN — 361 Hume Hwy. Ph 709 6600
GORE HILL — 162 Pacific Hwy. Ph 439 5311
MELBOURNE — 656 Bridge Rd, Richmond. Ph 42 1614
BRISBANE — 166 Logan Rd, Buranda. Ph 391 6233
AND NOW OUR NEW STORE AT PARRAMATTA — 30 GROSE STREET — OPEN FROM 1ST AUGUST.

MAIL ORDERS:
Box 747, Crows Nest.
NSW. 2065. Ph 439-5311

SHOP HOURS:
Mon — Fri 9AM to 5.30PM
Saturday 9AM to 12 noon
(Brisbane Sat. 8.30 to 11.30)

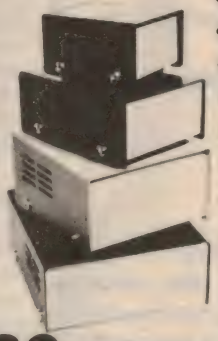
POSTAGE/PACKING CHARGES:

ORDER VALUE	CHARGE
$5 — $9.99	$1.00
$10 — $24.99	$2.00
$25 — $49.99	$3.00
$50 — $99.99	$4.00
$100 or more	$5.50

METAL PROJECT BOXES

Dress up your next (or last) project with these value metal boxes. Expensive looking, at a real budget price. These beaut boxes will make any home made project look professional. (Who looks inside!) 4 different sizes, ideal for most small circuits (and some larger ones too).

Cat H-2741 (56 x 83 x 102) $2.20
Cat H-2742 (61 x 103 x 150) .. . $3.00
Cat H-2743 (76 x 134 x 150) .. . $3.60
Cat H-2744 (60 x 160 x 184) .. . $3.80



SIZE IN M.M.

from $2.20

Australia's most popular CB!!!

NOW $40 OFF

FANTASTIC MIDLAND 882C — easily Australia's most popular AM set.

The Midland 882C has always had a reputation for being a high performance CB — and a very reliable one. It's the up-to-date circuitry and standard of Midland construction that makes the difference!

Has an antenna warning light to let you know if there's trouble 'up the stick', a noise blanker & noise limiter that really work without losing sensitivity, a delta tune for catching the other guy when he's off channel — all in all a top grade set.

And due to Dick's bulk buying, we can now pass on our savings to you. $40 off! That's an incredible saving for a top brand set with full parts and service back-up, isn't it?

****
OVER $200 IN THE USA!!!
****

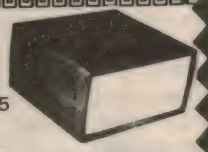
Cat. D-1436
was 179.50

NOW: 139.50

MINI SCAMP CONTEST

Have you seen it? The fantastic Dick Smith/Electronics Australia microcomputer contest. More than $2000 worth of prizes! See the full details in July E.A. (pages 74/5). Go to it— contest closes next month. Good luck!

UTILITY CASE 5.25



STRONG, DURABLE PLASTIC CASE
Used commercially as a case for a train controller, battery charger, supply, etc. Smart appearance, without costing a mint. Internal construction helps too — slots allow PCBs, etc easy mounting. Nice case for a charger, Watson?
Cat. H-2515 .. .. $5.25

THERMOMETERS

Go modern! Those glass & mercury things have had it! Measure degrees with decorum! Highly accurate ideal for clinical work, too: **35**
Cat Q-1480 (32 — 42°) $35
Cat Q-1490 (-10 — 80°) .. .$35

NEW

$169.50
AC & DC MODEL

Midland's new 886 — a base/mobile CB rig with all the features: With-it telephone style handset (or inbuilt speaker), built-in SWR meter, S meter, it's got the lot. Easy-to-clean plastic case goes with modern decor, too. Really snazzy!
Cat. D-1438 .. .. $169.50

You don't need to run two antennas just because you run CB — use the same stick for AM, FM & CB. It's also motorised. You don't get wet. Comes with all leads, splitter & tools. SWR adjustable.
Cat. D-4419 .. $59.50

AM FM CB
59.90

Manual version: Same specs, but not motorised. Lock-down type, easy to fit. You can even use both radios at once!
Cat. D-4418 .. $33.00

UR67 coax

Heavy duty low loss coax in stock again. 52 ohms, ideal for long runs. Save by buying in bulk — $113 per 100m roll.
Cat W-2095 .. .. $1.35/m

1.35 m

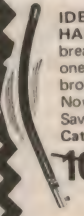
ETCH KIT $6.90

Contains everything you need to produce a professional PC board. Complete with detailed instructions, 150 x 100mm board, template, chemicals & tools. Supplied in sturdy etching tank case.
Cat H-5660 .. .. $6.90

MATRIX PANEL KIT

This pack contains 3 153 x 90mm sheets of commonly used materials in electronic projects: 22g aluminium • 16g black bakelite • 16g matrix board 0.15" pitch. All sheets fit exactly into the H-2751 Zippy box to make perfect panels for your projects.
Cat. H-5680 .. .. $2.00

RUBBER DUCK



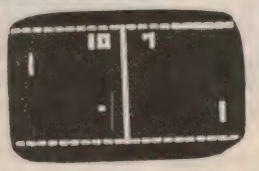
IDEAL REPLACEMENT FOR HAND HELD WHIPS! If you break your whip antenna, use one of these! Screw grips onto broken stub — or un-broken! Now reduced with new shipment. Save nearly $3.00 on old price!
Cat. D-4629 ~~$10.50~~ $7.90

~~10.50~~ **now 7.90**

4A CB SUPPLY

The ideal kit for all CBs — inc. SSBs. Supplies up to 4A on surge, 2A continuous — more than enough. Don't waste a lot of money on a ready-made kit. Full inst. mean anyone can build this kit!
Cat K-3448
.. .. .. $27.50

T.V. GAME



This one's really got it together! A lot of the TV games around are not much fun because of all the arguments over scores. This one has the score ON SCREEN. All the normal games, PLUS RIFLE SHOOTING! Get one for the kids these school holidays!
Cat. X-1126 .. .. ~~$79.90~~ **NOW 59.50**
INCLUDES RIFLE SHOOTING & SCORE!

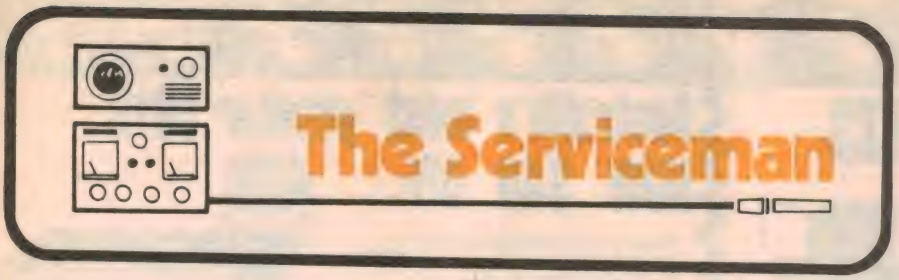
Responsible CB dealers wanted for quality MIDLAND products.

Dealers who have the responsibility to sell only well known brands with a guarantee of spare parts & service.

Interested? Contact Gary Johnston, D.S. Distributors, Phone Sydney (02) 439 5311.

DICK SMITH DEALERS
Perth 28 1599, Elizabeth Sth 255 2249, Pt Adelaide 43 931, Salisbury Nth 258 1267, Geelong 94 408, Bendigo 43 1977, Hobart 34 8232, Devonport 24 4216, Wiven Hoe 31 2560, Fyshwick 80 4307, Armidale 72 1895, Orange 62 6491, Tamworth 66 1363, Newcastle 69 1222, Goulburn 21 5440, Griffith 62 1577, Maryborough 21 4559, Alice Springs 52 1713, Stuart Park 81 6751

DICK SMITH MIDLAND DEALERS
Nowra 23 628, Bathhurst 31 1200, Wyong 52 1702, Nelsons Bay 82 1274, Lavington 21 6058, Lithgow 31 3882, Dubbo 82 2377, Lismore 21 3741, Orange 62 6986, Laureton 59 9060, Kenraville 29 5876, Milparinka 4, Gunnedah 42 0222, Gosford 24 4644, Glen Innes 1219, Georgetown 67 1472, Grenfell 43 1733, Cootamundra 42 1682, Mullumbimby, Bega 21 959, Gunnedah 43 7205, Ryistone 150, Leeton 53 2081, West Wyalong 721 2424, Nambucca Heads 68 6425, Bourke 72 2129, Wagga 21 2125, Taree 52 1488, Junee 388, Maclean, Tweed Heads 36 4649, Bateman's Bay 72 4555, Wollongong 29 2254, Forbes 52 2300, Wellington 1002, Dubbo 82 3793, Bunbury 21 2777, Port Headland 73 2504, South Fremantle 35 5875, Claremont 86 2433, Geraldton 21 1194, Waroona 33 1595, Wickham 87 1089, Carnarvon 41 1362, York, town 29, Renmark 86 6682, Pt Lincoln 82 1981, Peterborough 307, Horsham 82 3724, Morwell 34 3626, Mildura 23 2438, Ferny Creek 755 1091, Sale 44 2677, Billabong 24 5814, Portland 23 2774, Nth Geelong 78 9660, Shepparton 21 9006, Avoca 84 2166, Tnabunna 57 3135, Launceston 31 5688, Bundaberg 72 4263, Cairns 54 1035, Dalby 62 2389, Palm Beach 34 1248, Margate 84 2341, Myles 118, Mackay 51 1211, Victoria Point 207 7308, Townsville 79 8844, Gympie 82 1327, Cairns 55 4325.



Home units and TV aerials

I have a rather mixed bag this month. The continuing problem of communal TV aerials raises its ugly head again, there is the strange behaviour of a line output stage, and a nasty rumour from overseas about video games damaging TV screens. And I received a fan letter!

Before dealing with technical matters, this month, I feel bound to comment on a letter I received recently and which is reproduced herewith.

I don't receive much fan mail as a rule. Every now and again there is an odd complimentary comment tacked onto the end of a letter to EA's assistant editor; usually about the magazine in general, but sometimes mentioning my section, among others. The assistant editor dutifully passes these on to me, but I sometimes suspect that such complimentary remarks are an attempt to "butter him up" when the writer wants something special.

Then there are letters from other servicemen describing unusual faults they have found, or confirming faults I have described, or even taking me to task on occasions, when they choose to disagree. Sometimes they make the odd complimentary comment, but that's about all.

I wonder if you realise what you started, Mrs D. H.? The letter went the rounds of the office before I saw it, and resulted in lot of facetious comment. Someone had even gone so far as to put a pencil line through your signature and write "Mrs Serviceman" underneath it; apparently convinced that only someone with a vested interest could write such a letter!

But then, they're an uncouth lot in that office; no respect for anyone's finer feelings, if you know what I mean.

Seriously, Mrs D. H., I did appreciate your letter, even if it was mildly embarrassing. And thanks for the suggestion about writing short stories. The only snag is, what spare time?

Regular readers of the magazine may recall that the question of communal antennas has cropped up a couple of times in the recent past; once in these notes (August 1975) and once in the Editor-in-Chief's "Forum" column (February 1976). There was also a practical article, "One TV Aerial—Several Sets", in the June 1975 issue.

I was reminded of these discussions by a recent incident related to me by a friend. Of particular interest is the fact that he was able to effect a marked improvement in performance in spite of the fact that he used—by necessity—a somewhat unorthodox approach.

The installation involved a block of twelve home units. Two separate antenna systems, each servicing a group of six units, were employed. The "rub" was that both had been wired in much the same way that one would run 240V mains wiring.

There were no isolating resistors, no distribution amplifiers and no attempt to maintain an overall impedance match or to isolate receivers from one another; a situation that all too often typifies home unit installations. As can be imagined, the results were completely random, mismatches within the system producing standing wave effects, weak signals, reflections, ghosting, and mutual interference between sets due to local oscillator radiation.

Having a technical background, my friend was able to investigate the problem. As he readily admitted, his motives were completely selfish. All he wanted to do was to obtain decent reception for his own unit. As for the neighbours . . . well, they'd been putting up with the system long before he moved in and their problems would continue to be their own.

Fortunately for him the cure was quite simple. His unit is on the top floor and, as he put it, "I get first crack at the antenna". All he had to do was to insert four 150 ohm isolating resistors into the line—two between his set and those in the other five units, and two resistors in the line to the antenna.

His trick, then, was to simply regard those sets in the other units as one, a not unreasonable approach in view of his favourable location to the antenna. Certainly the circuit he employed is one typically used when two TV sets are to be run from a common antenna. More importantly from my friend's viewpoint, the modifications resulted in good colour reception on all four channels.

That was the last he thought of the installation until some twelve months later. To cut a long story short, another resident in the block approached him with similar problems, and he agreed to "take a look at the situation".

The neighbour's set was connected to the other antenna system in the building but, being on the middle floor of the unit block, was not as favourably located to the antenna. And, according to my friend, colour reception was quite poor. Results varied according to the length of the lead between the set and the wall socket, to the position of this lead, and as a result of people moving about.

On the basis that he had nothing to lose, my friend decided to introduce isolating resistors into the line in a manner similar to his own installation. Hopefully, this would result in a much improved impedance match between the antenna and the receiver, and provide some degree of isolation from sets further down the line.

There was little that could be done about those sets closer to the antenna, and all he could do was hope that their presence would not be too serious.

I gather that the results were quite beyond his expectations. With the isolating resistors installed, the neighbour's set turned in a "next-to-perfect" reception on all available channels. Naturally the neighbour was very enthusiastic at the outcome, and my friend somewhat gratified that he was able to be a good result without too much work.

Of course, it could be argued that the installation was not correct from a strict technical and theoretical standpoint. Ideally, one should provide correct isolation for every receiver connected to the

SPARE MY BLUSHES!

Dear Sir,

My husband reads "Electronics Australia" avidly and, in the interests of marital harmony, I have often attempted to share his interest. I find it incredibly boring, mainly because I understand about 10% of it.

However, "The Serviceman" article is a different matter! I still understand only about half of his material, but his style of writing makes all his articles fascinating reading.

His occasional flashes of wit and and his frequent expressions of emotion add spice to stories which embody all the good qualities in writing—an intriguing opening, a detailed descriptive body, and a satisfying, sometimes surprising, conclusion.

He has missed his vocation if he doesn't fill his spare time writing short stories for novels. Congratulations "Serviceman"!

Keep it up.

Sincerely Yours
(Mrs) D. H.

antenna system, with dummy loads for those units where no connection is made to the wall socket.

Still, it was the practical results that concerned my friend. And, as he was quick to point out, what else could he have done in the circumstances? Co-operation from other residents (always doubtful) would have been needed for further modifications and, with his own problems solved, there was little incentive to seek this co-operation.

So, if you encounter such a problem, it might be worth trying the same approach. After all, there is little to lose apart from four resistors and a few minutes with the soldering iron.

Talking shop with a colleague recently I was reminded of a curly fault which has tricked more than one serviceman—and experienced ones at that—into leaving footprints on the wall. I have an idea that I described this on a previous occasion but, for the sake of those who may have missed it, I think it bears repeating.

It occurs in typical monochrome TV line output stages but, as far as I'm concerned, only in those using a 6CM5 line output valve. The symptoms are typical; the line output stage simply won't work.

Normally such a fault would be a pretty routine kind of job. Having established that the valve itself is not faulty, it is usual to make a voltage check to confirm that the various electrodes, particularly the screen, are being properly supplied.

And when that reveals nothing, one starts looking for some more subtle fault, like shorted turns in the line output transformer or the failure of various capacitors involved with signal voltages rather than DC.

When all these check out OK the head scratching starts. You go over the routine again, convinced that you have missed something—and come up with the same answers. Eventually you reach the silly situation where there is nothing wrong with the stage—except that it won't work!

Or, as another colleage is inclined to express it, "Where somebody's not playing the cards I dealt 'em!"

How you finally solve the problem depends a lot on luck, your chances of knowing someone who has been caught before, or whether you are astute enough—or desperate enough—to try a completely different line of attack.

The latter approach was how I found my first one, though the motivation was desperation rather than astuteness. I switched the set off and began probing around with the ohmmeter, measuring everything from the output transformer windings to interconnecting hookup wires.

Finally I came to the screen resistor. Imagine my double take when it read open circuit. I didn't believe it at first but it was true. So what about the screen voltage I had measured? I switched the set on and measured it again. Sure enough, there was the screen voltage just as I had measured it before.

Thoroughly suspicious now, I took a more careful look at the reading. It was around 150V which, when I checked manufacturer's data, proved to be a bit on the low side. But even so, it wasn't low enough to completely disable the stage. More importantly, where was it coming from?

The answer is that this appears to be a strange characteristic of the 6CM5. By some internal mechanism it is able to build up a voltage on its screen when the latter is left floating, and with enough energy behind it to give a substantial reading on a VTVM, which is what I had been using.

I'm not sure what form the "internal mechanism" takes. One suggestion is that it is secondary emission effect, whereby electrons passing through the screen structure knock off other electrons and give it a positive charge. Except that, without any real screen voltage, there may not be much electron stream.

Another suggestion is that it is an electrostatic effect, the screen acquiring a charge as a result of the nearby high voltage on the plate.

Anyway, whatever the theory, it is a nasty one in practice. What's more, it gives the lie to the age old concept that, the more sensitive the voltmeter, the more accurate will the readings be in a high impedance circuit. I suppose, strictly speaking, the reading is quite accurate, but it is no less misleading for all that.

"Do electronic games spoil the colour of a TV set?

This question was posed to me by a customer recently, apparently prompted by a rather garbled report in a newspaper. My first—private—reaction was to dismiss the idea in one curt phrase. Fortunately, diplomacy demanded something less dogmatic and more polite.

As it was, I simply admitted that I had not heard of any such problem, but offered to find out what I could if he was really worried about it. As it turned out, he had no reason to worry immediately, but was mainly curious.

Subsequently, I was glad I had not taken too hard a line. Browsing through an American technical magazine a few weeks later, I came across an item which almost certainly explains the story. It seems that dealers who had left TV sets running all day and every day, with games patterns on the screen, discovered that the pattern of the game "court" had been burned into the screen.

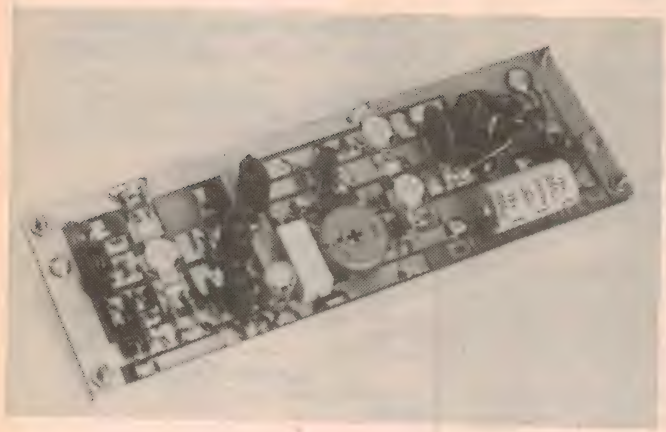
On the other hand there have been no consumer complaints as yet. Only where the patterns have been left on for very long periods, as in store and window displays, has there been a problem.

Technically, it is nothing new, nor is it confined to the colour sets. It has cropped up several times over the years, long before the advent of colour. There was a story about how the BBC displayed a "Rain Stopped Play" notice during a cricket match and left it running for several hours while waiting for play to resume. Some people who left their set running so as not to miss the resumption, found they had the notice permanently written on the screen.

A similar problem has arisen when, on the death of a famous person, TV stations have displayed their portrait for long periods against a suitable musical background. The discovery, sometimes much later, of a faint outline of the person's features was even attributed to supernatural causes by more imaginative types.

So, if someone poses this question to you, you can provide a sensible answer and one which, hopefully, the customer can understand.

Solid-state HF linear works up to 30MHz



by IAN POGSON

Since describing a transverter and a transmitter recently which used a solid state linear amplifier for 3.5MHz, we have had requests for details on using this amplifier at higher frequencies. Although we have some reservations regarding its use at higher frequencies, it can be done and the following article describes how to make the modifications.

In April, 1976, we presented the 27/3.5MHz Transverter and then in September, 1976 we followed up with the 3.5MHz Novice Transmitter. Both of these projects used a solid state linear amplifier rated at about 10 watts output. Since then, we have been asked on a number of occasions whether the linear could be used at higher frequencies. We even had one request relating to its use at about 52MHz.

No attempt has been made to take the linear up to 52MHz but we did face up to the idea of taking it up to cover, say, from 20MHz to 30MHz. On checking the original linear, we found that it fell off rapidly above about 5MHz. Quite obviously, some changes had to be made in order to make the device function at higher frequencies.

Mr Ken Nisbet was the designer of the original circuit and so it seemed reasonable to get his opinions on how best to make the necessary modifications. A discussion with Mr Nisbet resulted in some suggestions regarding the design of the various coils and changing the value of the capacitor across the collectors of the output stage.

Armed with these suggestions, I proceeded to build up a new unit altogether and to fit more suitable coils for the higher frequencies. In short, the circuit looks exactly the same as the original but most of the coils have been modified and the .0022uF capacitor across the collectors of the output stage has been reduced to 100pF. It is as simple as that and units already built may be modified quite readily to cope with the 20MHz to 30MHz range.

I should point out, however, that the original design was optimised for around 3.5MHz and when modified for the higher range just mentioned, the design will not be optimum for 3.5MHz or, indeed, for 7MHz OR 14MHz. It would not be difficult to make the circuit suitable for operation on either 7MHz or 14MHz (not both at once) by fitting coils appropriate to the frequency band of interest, along with an appropriate change in the value of the capacitor across the collectors. However we have not done this ourselves.

In common with most circuits, this one takes somewhat more driving at the higher frequencies than it does at the much lower frequencies. Even so, at 30MHz, the new design needs only a modest amount of drive. By way of illustration, I used a 27MHz transceiver, which was delivering 3 watts into a dummy load. Across the load, I connected a 200 ohm potentiometer and a 470 ohm resistor in series, with the pot at the earthy end. Drive to the linear was taken from the pot and this was sufficient to fully drive the linear.

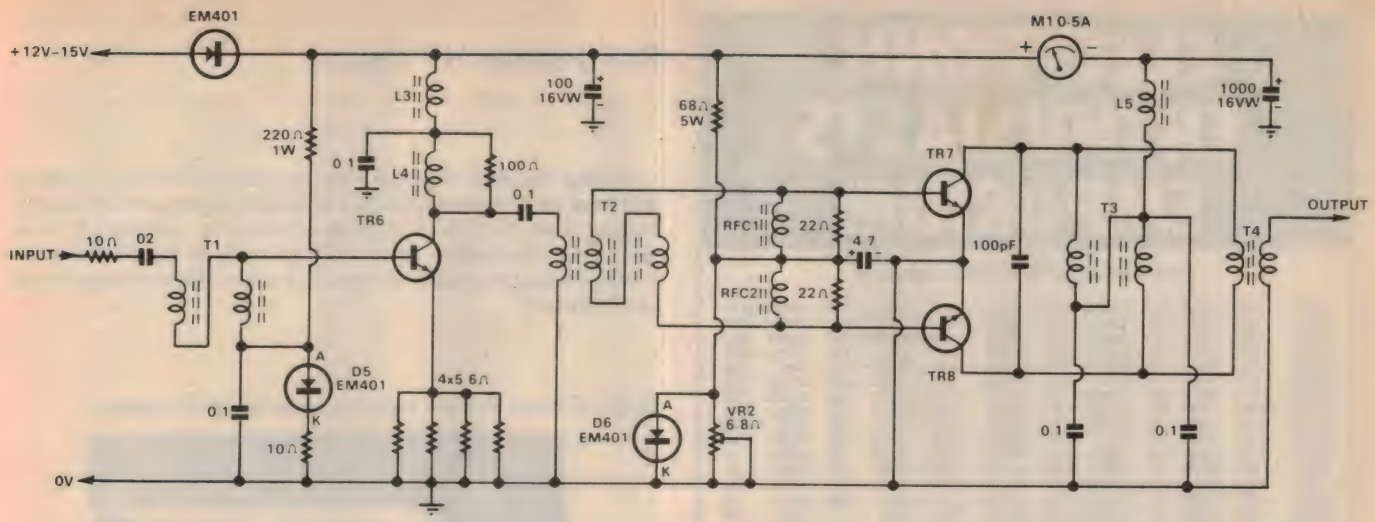
A check on the 3.5MHz version of the linear amplifier revealed that when it was fed from a supply of nominally 13.8V and driven to 10 watts output, there was a certain amount of clipping on the modulation peaks at 100% modulation. This is normal in that when driven to 10W unmodulated, at 100% modulation the peaks would be 40W (40W PEP) and the 2N5590 transistors are not capable of delivering 40 watts of power.

As may be expected although the higher frequency version can be driven up to 10W output, when 100% modulated severe clipping takes place and the power output must be reduced to about 6W to bring this clipping to an acceptable level.

The foregoing facts make the linear amplifier somewhat less attractive than it may appear at first. For example, if one is already using a type of transmitter capable of a nominal 4W output, it would scarcely be a proposition to lift this level to say, 6W. However, the design is an interesting one and as we have had requests it was decided that it would be worthwhile giving the details for interested readers. To this end we are including a parts list and sufficient details for building and adjusting the unit.

For readers not already familiar with the circuit of the linear amplifier, the complete unit is built on a printed board and contains TR6 as the driver, and TR7, TR8 as the push-pull final power amplifier. The whole power amplifier is broad banded. This does away with the usual rather large tuning components. T1, T2 and T3 are broad band transformers wound on ferrite cores. Diodes D5 and D6 are used to control the bias necessary for linear operation. As the transistors have a high current gain, protection is necessary to prevent thermal runaway and so bias has been made relatively stiff.

Transformer T1 is a stepdown input to the base of the driver transistor. The 10 ohm resistor at the input is included in the interest of driver stage stability. Inductor L3 and the 0.1uF capacitor are decoupling for TR6, whilst L4 is loaded with 100 ohms to reduce the possibility of stray resonances. The stepdown transformer T2 divides the signal to feed TR7 and TR8. RFC1 and RFC2 are similarly loaded with 22 ohms each to reduce the



SOLID STATE HF LINEAR

possibility of unwanted resonances.

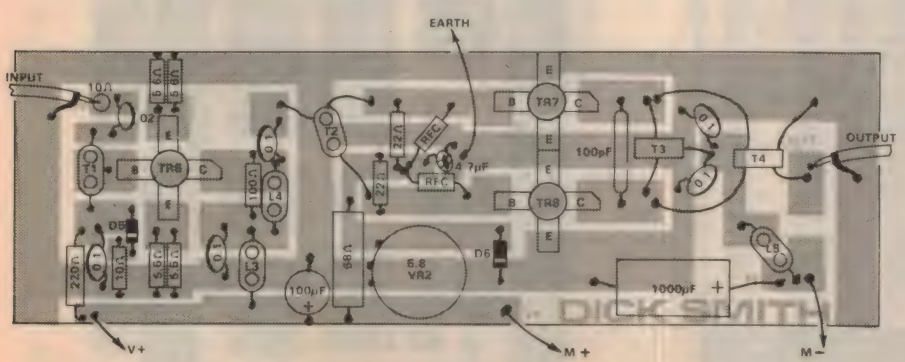
T3 in the power amplifier collector circuits is the supply feed and combining transformer. T4 transforms the low impedance output up to the desired 50 ohms. L5 and two 0.1uF capacitors provide decoupling for the output stage.

The board cannot be properly assembled until the coils are wound and so this job should be done first. Winding details are given in the table and in the various diagrams. Winding the coils, although not difficult, does call for a certain amount of care, particularly in terminating the various windings. In cases where a centre tap is not used it should be cut off fairly short and bent up alongside the core, so that there is no danger of it shorting against other components, or the board copper.

A point worth mentioning relating to the coils, is that T3 is shown in the table and diagrams as being wound on a toroidal former. This is quite in order but during development of this new unit, I replaced this coil with one identical with that of T1. Comparisons between the two items showed that there was no discernible difference and so readers may fit which ever happens to take the fancy. Just for the record, the prototype has one fitted the same as for T1.

Guided by the layout drawing, it will be up to each individual builder to determine the order of assembly of the various components on the board. The 10 ohm resistor at the input will only be soldered to the board at one end; the other end will be stood off the board ready to take the centre conductor of the input cable. Do NOT solder the three 2N5590 transistors in place at this stage.

We are not presenting the project in any sort of case but it is essential to provide adequate heat sinking. As a very minimum, and what we used to develop this unit, use a sheet of 20 gauge aluminium, the same size as the printed board but with a mounting foot along one edge. This would allow for the unit to be mounted on a base panel, along with possible driver or exciter equipment. We hasten to point out that this heat sink got quite hot during testing and the hint was that under more rigorous conditions, more adequate heat sinking would be required.



Above is the component overlay diagram for the PCB. Note that the components are mounted on the copper side of the board.

PARTS LIST

1 Case and/or heat sink (see text)
1 Meter, 0-5A, 52mm x 48mm (Q2030) (Dick Smith)
1 Toggle switch, SPST
2 Coax sockets
1 PCB (Dick Smith)
5 Balun cores, Philips 4312-020-31520
2 Choke formers, Philips 4312-020-36640
2 Toroids, Neosid 4327R/2/F25/EC
3 Transistors, 2N5590
3 Diodes, EM401 or similar

RESISTORS
(¼W unless stated otherwise)
4 5.6 ohms
1 6.8 ohms WW tab pot, Philips 2322-011-02688
2 10 ohms
2 22 ohms
1 68 ohms 5W
1 100 ohms
1 220 ohms 1W

CAPACITORS
1 100pF ceramic
1 .02uF 50V ceramic
5 0.1uF 50V ceramic
1 4.7uF 30VW tantalum
1 100uF 16VW electrolytic
1 1000uF 16VW electrolytic

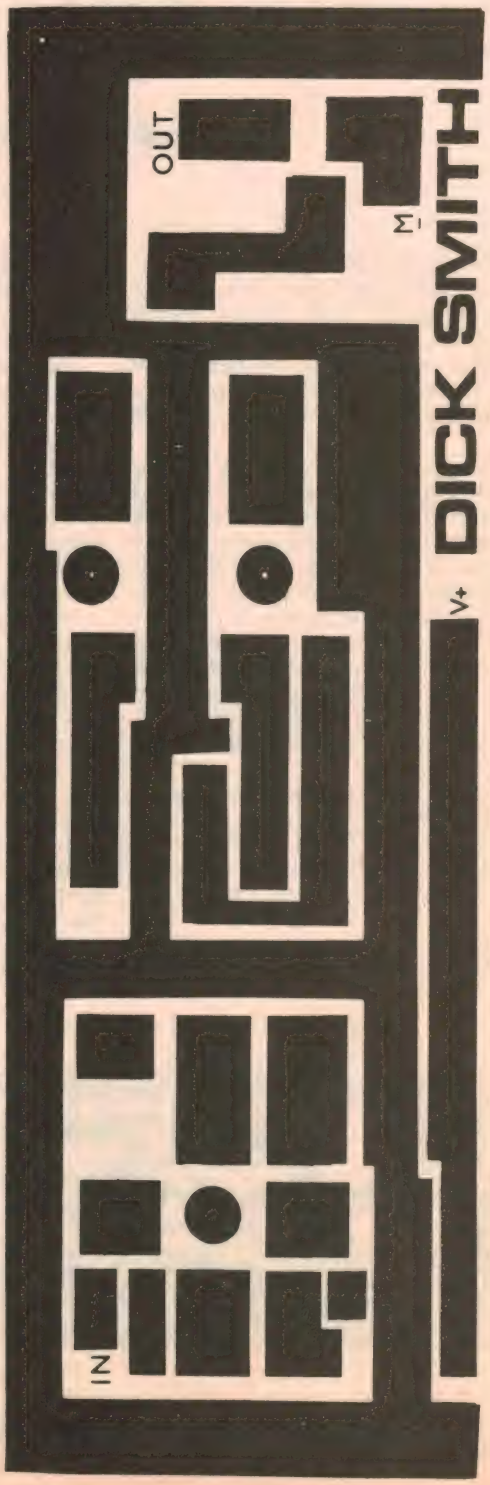
MISCELLANEOUS
Coax cable, heavy and light hookup wire, winding wire (16B&S, 20B&S, 24B&S), solder, screws, nuts.

Note: Resistor wattage ratings and capacitor voltage ratings are those used in the prototype. Components with higher ratings may generally be used provided they are physically compatible. Components with lower ratings may also be used in some cases, provided the ratings are not exceeded.

Solid-state HF linear

Having decided on what you are going to use for a panel and heat sink, four holes must be drilled to mount the board. Having done this, the board should then be screwed in position. Then determine the centre of each of the three holes for the transistors and drill clearance holes. These holes should be deburred.

Below is an actual size reproduction of the PC pattern.



Before fixing the transistors, we bent up the ends of the connection lugs. About 2mm or so was bent up at right angles at the end of each lug. This effectively shortens the lugs and also allows a small amount of pressure to be applied to each lug as it is soldered in place. After bending, tin each lug, together with the corresponding areas on the board. Mount the transistors and screw each one in place with the nut supplied and with the dot indicating the collector. They may now be soldered at each of the four points.

Before it can be tested and adjusted, and later used in conjunction with an exciter, the unit will have to be set up in some kind of box or equivalent. Leads for input and output must be provided, together with power supply and control circuit leads. Suitable sockets should be provided and it is essential to provide a 0-5A meter for the output stage collectors.

With the unit now completely assembled and wired, a thorough check should be made, making sure that all components are in the right place and that polarities are correct. Satisfied that all is well, a power supply is needed that will deliver between 12 and 14 volts, preferably 13.8 volts, at about 1½ amps. However, if you have ideas of using the amplifier on SSB, then it would be wise to make sure that the supply will deliver about 2½ amps normally, with peaks of up to 5 amps. A car battery may be used for the power supply. You will also need a dummy aerial, 50 ohms non-inductive and capable of handling 10 watts.

To adjust the amplifier, proceed as follows: Set the 6.8 ohm variable resistor VR2 so that there is no resistance in circuit. This cuts off any forward bias on the output transistors TR7, TR8. Connect the dummy aerial to the output and connect the two power supply leads to the supply. (Make sure that you have a silicon power diode in series with the positive lead, to avoid damage in the event of accidental reverse polarity.) Set the appropriate drive input control to zero.

Now switch on the power supply, at the same time watching the 5A meter. The meter should show little or no reading. If it swings full scale, there is obviously trouble. This should not occur, however, as we have added the 10 ohm resistor at the input to the driver to stop this stage from "taking off".

Assuming that all is well, take a voltage measurement at the emitter of the driver transistor TR6. Readings which we took on two early units were 0.42V and 0.45V, and the new one gave a reading just under 0.4V. Your reading should be close to these figures.

Now adjust the variable resistor VR2 with a screwdriver, and set the collector current for the final at between 0.1A and 0.2A. This corresponds to between a half and one division on the meter scale.

With the recommended 13.8 volts, a satisfactory performance may be expected. It would be wise not to push the supply too much beyond 14 volts, although a maximum of 15 volts is indicated on the circuit.

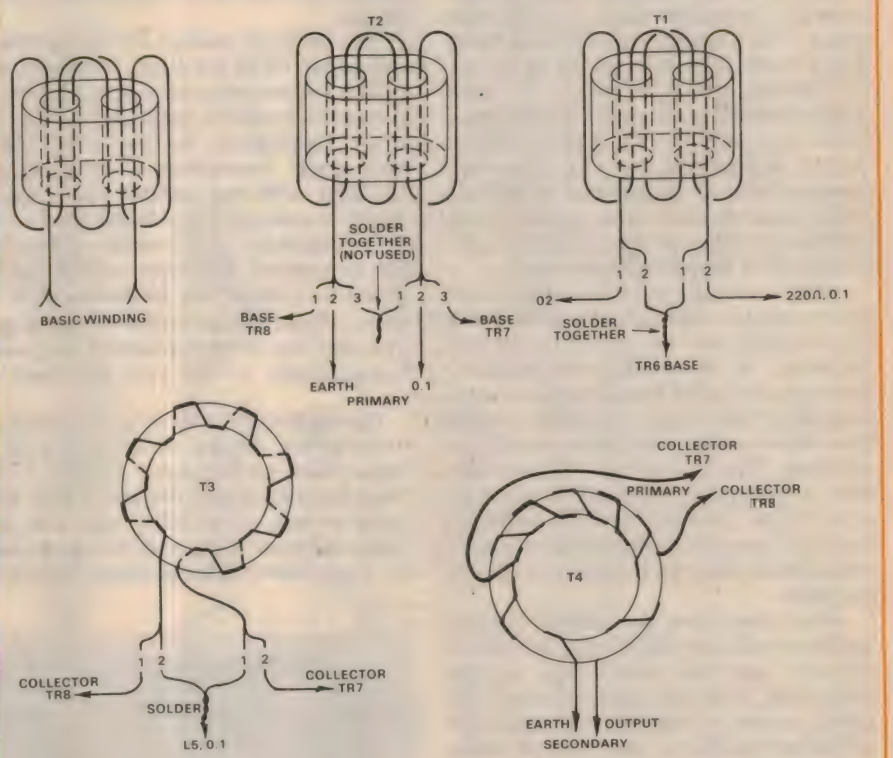
The final is capable of being driven to 20-30W PEP and it is also capable of being driven to this level on CW, although if this is done on a prolonged basis damage may be done to the output transistors.

It is worth noting that if the two final transistors are replaced with a pair of 2N591s, it should be possible to drive the amplifier to 40 or 50W. The supply voltage will remain at the nominal 13.8V but it may be necessary to make a few minor changes to accommodate the new situation. The output transformer T4 may need a change, possibly a reduction by one turn or so on the secondary. Also, it may be necessary to change the turns ratio on the driver transformer, T2, to fully drive the final. We have not tried these modifications and it would be necessary for anyone embarking on the idea to do some development along these lines.

The amplifier is designed to work into a 50 ohm aerial system. It is essential that this be observed and the SWR should be less than 1.5 for correct operation. In any case full output will not be realised unless this is so. In addition, the final may produce spurious output components unless it is correctly terminated.

As the linear is broadbanded, harmonics are present and if the transmitter is to be used on a broad band aerial such as a trap dipole or similar which will respond to harmonics, the unit should be used with an aerial tuning unit or a low pass filter. If the transmitter is to be used on a mobile whip or a high Q aerial system, then no filter is necessary and the output may be fed directly to the aerial, making sure that it is 50 ohms.

Coil Winding Data



L3, L4, L5. Parallel two strands of 24B&S enamel wire and twist together evenly with about 5 twists per inch. Wind on balun core as shown in drawings and then carefully terminate as shown in drawing. Centre tap not used.

T1. Wound and terminated the same L3-4-5 but centre tap used.

T2. Parallel three strands of 24B&S enamel wire and twist together with about 5 twists per inch. Wind on balun core similar to previous units above and carefully terminate as shown in drawing. Centre tap used.

T3. Parallel two strands of 24B&S enamel wire and twist together evenly with about 5 twists per inch. Wind eight turns on toroid and carefully terminate as shown in drawing.

T4. Wind secondary of 6 turns of 20B&S enamel wire on toroid. Then wind primary of three turns of 16B&S enamel over secondary as shown in drawing.

RFC1, RFC2. Wind in formers by running 26B&S enamel or TC wire continuously through five of the six holes, giving a winding end at each end of the former.

Temperature compensated crystal oscillator

It is well known that one of the most important limiting factors to the stability of a simple quartz crystal oscillator is its sensitivity to temperature changes. Even with AT-cut units, temperature is still a factor to be considered. However it is possible to largely compensate for the effects of temperature change by making use of a simple thermistor-variable capacitance combination.

by IAN POGSON

The pursuit of greater and greater accuracy, indeed perfection, seems to be one of man's endeavours in many fields. It is a challenge which seems to be part of human nature, even if total achievement would appear to be impossible. Obviously there is a lot of satisfaction to be had in trying! Our immediate concern here is to attempt to achieve more accurate and stable quartz crystal oscillator performance, consistent with a minimum of complexity and cost.

Many years ago and before the advent of the crystal oscillator, the self-excited LC oscillator met the needs of the day. However, as more and more demands were placed on the available space in the frequency spectrum, it became evident that more stable oscillators would be required. This was met by the introduction of the crystal oscillator in what we would now consider a rather primitive form. Even so, the performance of a crystal oscillator was much superior to the LC oscillator.

After some time, the stability offered by the crystal oscillator, with crystals of various cuts and sometimes strange behaviour, was not good enough. By using crystals of suitable cuts and with acknowledgement that temperature variation caused serious variations in oscillator frequency, the solution to the problem was to install the crystal in a special oven which was thermostatically controlled within a very small temperature range, at a temperature somewhat above the maximum likely ambient.

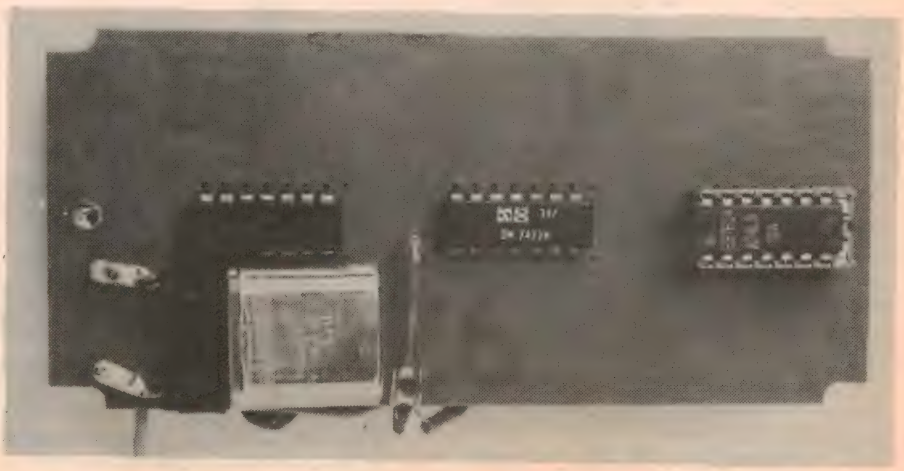
This was a very satisfactory solution to the problem and is still used very widely. With sophisticated equipment, very high orders of stability can be achieved. However, with the advent of solid state circuitry, with its dramatic reduction in size and power consumption, the oven became a distinct embarrasment both in size and power consumption—for mobile and portable equipment in particular.

The obvious answer to this problem was to get rid of the oven. However, the question then arose as to how the crystal frequency could be stabilised without an oven. Fortunately, by this time, some very good thermistors were available, together with the variable capacitance diode or varicap. These items were small and inexpensive and it seemed reasonable to suppose that they could be combined to counter the frequency drift of the oscillator due to temperature change. The idea has been developed and used commercially for the past ten years or so.

During the past year or so, I have been investigating means of achieving fairly high orders of frequency stability and I have been forced to the conclusion that such orders of stability can only be achieved even with good AT-cut crystals by some form of temperature compensating or stabilising device, be it an oven or whatever. Although modern ovens are quite small and consume a modest amount of power, they are still fairly expensive and the amount of power required can be quite high. This brought me to thinking along the lines of temperature compensation, using a thermistor and a varicap.

Before starting on the job of compensation, one must have an established crystal oscillator circuit to work on. A good place to start seemed to be to use a crystal oscillator using a TTL IC. The one which I chose was an adaptation of a circuit which was described recently in Electronics and which we ran in Circuit & Design Ideas for March, 1977. Some TTL oscillators can give trouble in starting due to biasing problems, but the circuit chosen avoids this problem and I have found it to be very reliable.

The circuit has a trimmer capacitor connected in series with the crystal.



The prototype was assembled on standard DIP board. Note the close proximity of the thermistor to the crystal.

Apart from the crystal itself, the series trimmer is virtually the only other component which has any significant influence on the frequency of oscillation of the circuit. It may therefore be used to trim the frequency to agree with some external standard if required.

We can reasonably assume that a crystal to be temperature compensated will have a negative characteristic. In other words, an increase in temperature will cause a decrease in the frequency of oscillation, and vice versa. This is not always the case, but the opposite situation can be dealt with quite readily, as will become clear later on.

As we have just seen, the frequency of oscillation of the circuit is influenced by the capacitance in series with the crystal. So it seems reasonable that we could introduce a varicap in the series circuit and control it in such a way as to counter the effects of temperature change.

Readily available thermistors have a negative temperature characteristic, in that the resistance decreases with an increase of temperature. If we include a thermistor in series with a resistor, to form a voltage divider across a suitable voltage source, then the voltage at the junction of the thermistor and resistor will change with temperature. This changing voltage can be used to bias a varicap and so make its capacitance change.

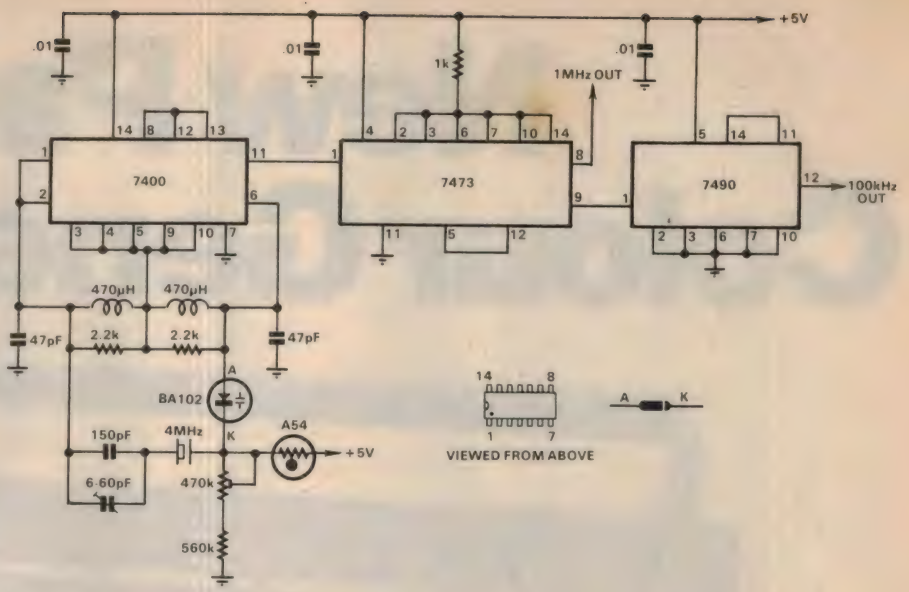
Let us have a look at the circuit to see how it is done. There is a trimmer in parallel with a fixed capacitor, on one side of the crystal. On the other side of the crystal, we have effectively added more series capacitance in the form of a varicap, with its anode connected to the appropriate element of the IC and the cathode connected to the crystal. The junction of crystal and varicap is connected to the junction of the thermistor and resistor in series, the latter two being connected across the 5V supply for the IC.

It will be seen that the thermistor is on the high potential side of the voltage divider and with the resistive values, a potential a little under 5V appears at the junction. The potential on the anode of the varicap is about 1.5V and this means that there is a reverse bias of nearly 3.5V applied to the varicap.

Before proceeding further, it should be pointed out that it is most important that the 5V supply be very well regulated, otherwise the whole purpose of the exercise would be defeated.

With all the elements of the circuit now in place, let us consider what happens when there is a change in temperature. We will assume an increase in temperature uniformly applied to all parts of the unit.

The crystal will tend to run lower in frequency. Now the thermistor will be reduced in resistance and this means that the voltage at the junction of the thermistor and resistor will increase. This increase is applied as an increase in bias



TEMPERATURE-COMPENSATED CRYSTAL OSCILLATOR

The circuit diagram of the temperature-compensated crystal oscillator.

to the varicap and accordingly its capacitance is reduced in value. The effective capacitance in series with the crystal has therefore been reduced and the frequency of the crystal will tend to increase, thereby offsetting to a greater or lesser degree, the initial reduction in frequency.

It is important to note that the term "greater or lesser extent" was used in the above paragraph. This implies that compensation might be either under or over that required for optimum compensation. The amount of compensation is adjustable by means of the 470k potentiometer provided in the lower potential side of the voltage divider. By careful adjustment of the divider, good temperature compensation may be achieved.

Looking at the circuit again, you will see that the crystal oscillator proper uses only two of the four sections of the 7400 IC. The output of the oscillator has been put through each of the other two sections successively. These two sections would otherwise be left unused and passing the signal through them affords a worthwhile measure of isolation for the oscillator, before it is fed into a 7473 dual J-K master-slave flip-flop. The signal is divided by four, emerging at 1000kHz. The 1000kHz signal is fed into a 7490 decade counter IC, where it is divided by ten, thus emerging at 100kHz. Both the 1000kHz and 100kHz components may be used as required.

A word about crystals suitable for this application may be appropriate at this stage. It will depend upon the order of precision which you are expecting, together with the depth of your pocket book, as to just what type of crystal you use. I contented myself with a modest and readily available type and although it has not been in operation for very long at the time of writing, it shows very good promise.

I used a standard type of plated crystal mounted in a style "D" holder and with the can sealed by soldering. It was obtained from Bright Star Crystals Pty Ltd, 35 Eileen Road, Clayton, Victoria 3169. It is pointed out by experts that the soldering process can introduce contaminants into the can and so lead to a degrading of the crystal performance. The same type of crystal is available in a cold welded can, for an increase in cost. A further improvement is to use a crystal which is enclosed in an evacuated glass envelope. This is more expensive again. However, I imagine that most of us will be quite content with the soldered can, which in my opinion is the minimum requirement for this application.

Crystals in the frequency range of 2000kHz and 5000kHz are the most suitable. They will normally be AT-cut and crystals within the above range show characteristics of high stability, when compared with others outside the range. While it should be in order to use frequencies higher than 5000kHz, I would strongly advise that you do not attempt to use frequencies lower than 2000kHz. You could be disappointed with the results. I settled for 4000kHz as being near to the optimum. If you go higher in frequency than 5000kHz, it will be necessary to reduce the two 47pF capacitors to 22pF or so.

Do not attempt to use one of the old disposals type FT243 crystals. While waiting for my crystal I tried one of the old warriors and while it oscillated quite readily and again while I understand it to be an AT cut, it had wild reactions to temperature changes, to such an extent that it required more compensation than the circuit could provide. I also suspect that

New Pal Colour Generator.

Designed for home call service.

This new Philips PM 5501 lightweight pattern generator covers VHF and UHF bands III and IV.

It provides the five key test patterns needed for fast and accurate checks on screen alignment. There is also a 1 KHz tone to allow sound checks.

The PM 5501 is a low cost unit which weighs a mere 1.25 kg. So it is easy to carry on calls. Yet the quality of the test patterns, which meet CCIR 625 line TV standards, is good enough for technical education and training use. It is suitable for colour or black and white receivers.

The five key test patterns are:

- 8 bar grey scale
- Cross hatch
- 100% white pattern with burst
- Red patterns with 50% saturation
- Standard colour bar with white reference 75% contrast. This allows on-screen alignment of matrix circuiting – unusual in this price class. Can be converted to a full bar signal.

The PM 5501 meets a wide range of checking and aligning requirements in both home and workshop. For full information on this versatile new low priced unit, send in this coupon.

PHILIPS
Scientific & Industrial Equipment
P.O. Box 119, NORTH RYDE. 2113
I am interested in your PM 5501 PAL colour generator.
Please ☐ send me literature
☐ have a representative contact me
Name .....
Business .....
Address .....
.....
Postcode.....Tel .....

PHILIPS
Test and Measuring Instruments

PHILIPS

38.2625

even if compensation could be achieved, the frequency stability due to other causes may not be good enough.

As we are dealing with a circuit from which we are expecting a high degree of stability, only high grade components should be used throughout. Either Philips carbon film, or IRC metal glaze resistors (or similar) are suitable. The .01uF bypass capacitor is not critical and may be a ceramic. The rest of the fixed capacitors should be polystyrene types. Trimmers should be of good quality and the choice is left to the builder. The 470k subminiature trimpot does not allow much scope for choice and we used the standard line made by Philips.

The 470uF RF chokes and the BA102 varicap should present no problems. The thermistor which I chose is the ITT type A54 as being suitable for the application and at the time of writing, is readily available. The A54 thermistor has a nominal resistance of 50k at a temperature of 20°C and if you have difficulty in obtaining this particular type, then a near equivalent should be satisfactory. The maximum power dissipation permissible at 20°C is 60mW and this figure should be considered when employing a substitute. It would be wise not to fit a thermistor which had a significantly lower dissipation rating.

The ICs which I used initially were all of the 74 series TTL devices. In fact, due mainly because I soldered in the 7400 used for the oscillator and the 7473 which divides the crystal frequency by four, these have been left in situ. However, for the following 7490 decade divider I provided a socket and this made it quite convenient to change the 7490 for the lower current consumption type 74LS90. The substitution proved to be quite satisfactory and because of the lower current consumption, I left it in this position. Readers may choose whichever device suits their particular purpose. As for substituting for the first two devices, I am unable to comment but it may be worthwhile to look at the possibility if so desired.

While I consider that it would be desirable to initiate a printed board to accommodate the oscillator and dividers, it is the type of project which may not be made in large enough numbers to justify a special printed board. In the circumstances, I have made use of part of one of our standard DIP boards, which are available from Radio Despatch Service, RCS Radio, who make them, and possibly others. This arrangement has proved to be quite satisfactory. The complete assembly is housed in the smallest of the Eddystone range of diecast boxes.

From a constructional point of view, I do not propose to go into any great detail. Only experienced readers are likely to want to make up this unit and with this in mind, I will only go into details of some of the more important aspects which should be considered to ensure successful performance.

As mentioned earlier, I soldered the oscillator and the next IC straight to the board, providing a socket for the 7490 decade divider. The reason for soldering the first two ICs straight in, is to make sure that there are no indefinite contacts which could cause frequency instability. Whether or not you may see fit to use a socket for the 7490, or not, is up to individual choice. Reference to the picture will show that the crystal is mounted on the same side of the board as the ICs. A socket is used and short pieces of tinned copper wire are used to connect from the socket lugs, through drilled holes in the board, to copper pads on the other side. Also , it may be seen that the thermistor is mounted close to, but not touching, the crystal case. The thermistor is floating on its leads, which run to points on the other side of the board.

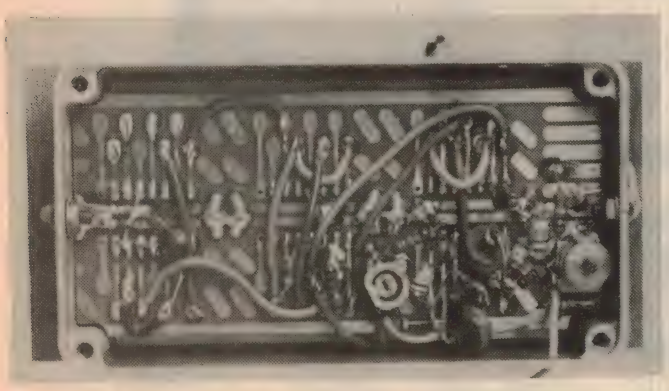
The rest of the assembly and wiring, on the copper side of the board, should be done neatly and with leads as short as practicable. Reference to the picture should be of some help in doing this.

Setting up the oscillator is an exacting task and must be done properly if good results are to be achieved. One way or the other, the output, either at 1MHz or 100kHz will be compared with some external standard. This may be a counter in the first instance and possibly VNG, or some other standard later on. I am actually controlling my own unit from low frequency caesium–stabilised transmissions, using an AFC system.

With the unit supplied from a very well regulated 5V power supply, and having established that it works, the oscillator is brought to frequency against the counter, or whatever, and it should be allowed to settle down for at least a few hours. The oscillator should then be adjusted very carefully against the standard. The oscillator's performance should then be noted with respect to temperature changes, either natural ones, or you may make use of an oven, refrigerator, etc., to speed up the process. Compensation is effected by adjusting the 470k trimpot. Checks may reveal that the trimpot may not be able to cope with proper compensation and so the 560k resistor in series with it should be changed accordingly.

While I have not any actual figures which could be quoted, and while it must be conceded that perfect compensation is not achieved, nevertheless, my experience has been that between about 5°C and 40°C, very little drift occurs. Commercial manufacturers of compensated crystal oscillators rather conservatively only claim one or two parts in 10^6, over a somewhat greater temperature range, but with the smaller temperature range I have found that one order better than this can reasonably be expected.

Whatever one's reason for building a temperature compensated crystal oscillator, the pursuit and study of its performance can be very fascinating. In common with the professionals, your crystal oscillator will need to be compared with external standards in order to evaluate its performance and value as a secondary standard.



Minor components are mounted on the copper side of the board.

The prototype, built into a small Eddystone diecast case.

Build your own
Frequency Counters

Power/Time Base Switch Turns the IM-4100 on, selects between kHz and MHz for frequency measurements, and selects second or millisecond time bases for period measurements.

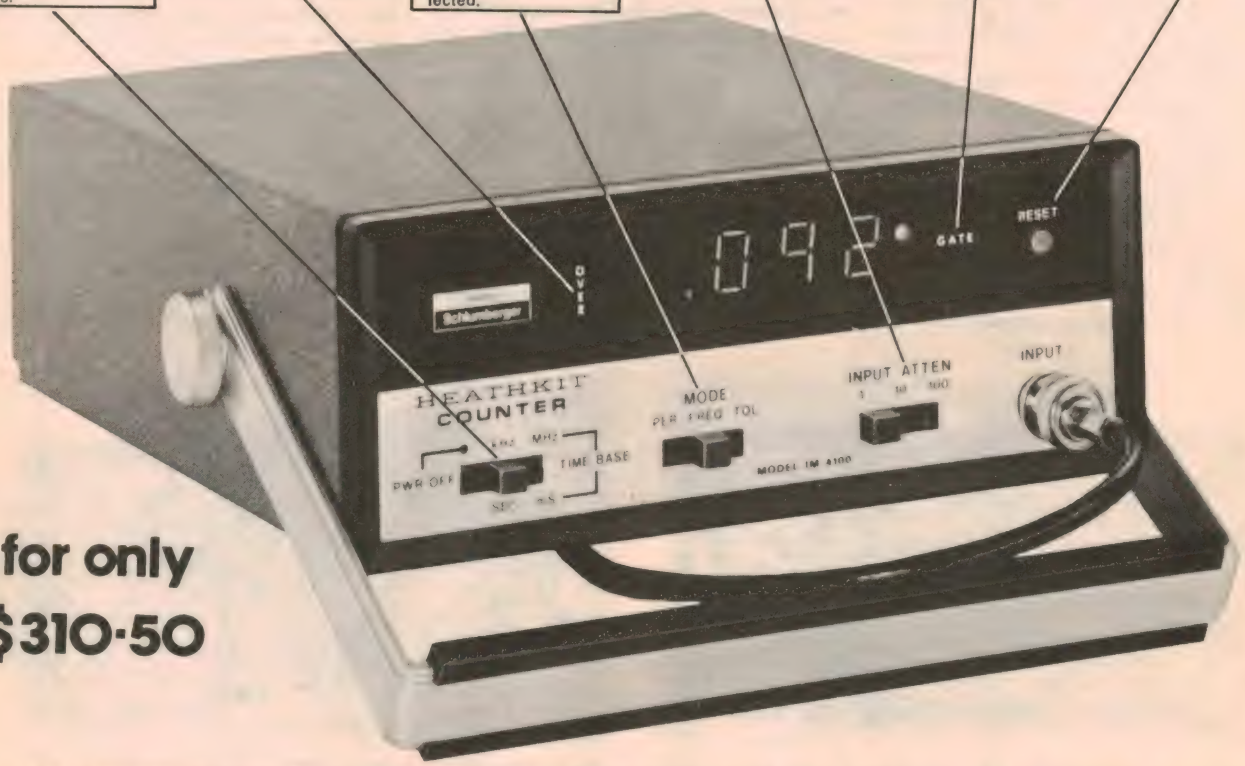
Overrange Indicator Indicates when the number to be displayed is larger than the display can handle.

Three Operating Modes Modes for frequency measurement to 30 MHz, period measurements to 99.999 seconds, or totalize for events counting to 99,999 are easily switch-selected.

Input Attenuator Three-position switch provides ÷1, ÷10 or ÷100 attenuation of the input signal.

Gate Lamp Flashes on when the display is updated. Also functions as a logic probe for troubleshooting during calibration or servicing.

Reset Switch Push-button switch resets the display to zero in any mode of operation.



for only $310-50

Our most versatile counter — frequency to 30 MHz, period to 99.999 seconds, events to 99,999

The Heathkit IM-4100 is an almost unbelievable counter value. It's a full five-digit frequency counter. It will also function in period mode or totalize mode. It provides built-in input attenuation and 12-volt operation all in one compact package. The latest digital design and a stable 10 MHz crystal oscillator assure outstanding accuracy and precision on all measurements. Its excellent resolution makes it ideal for a variety of signal alignment applications.

As a frequency counter, the IM-4100 is guaranteed to 30 MHz with 1 Hz resolution. Sensitivity is a low 15 mV from 50 Hz to 30 MHz, 50 mV below 50 Hz.

In the period mode, it measures intervals up to 99.999 seconds. Using the millisecond time base, it resolves to 1 μsec! This mode can be used for low frequency measurements with high accuracy. Just position the TIME BASE switch to mS and the MODE switch to PER. Then solve the equation $f = 1/\text{period}$, using the displayed value.

The totalize mode will add up (totalize) event pulses up to a count of 99,999. Pushing the RESET button starts the count at zero. An inhibit signal can be applied through a rear panel terminal to stop the totalize mode at any time, without loss of the displayed count.

The front panel attenuator switch allows the amplitude of input signals to be divided by 1, 10 or 100. The pushbutton RESET switch quickly resets the display to zero in *any* mode. Front panel display includes overrange indicator and a gate lamp.

A rear panel switch easily selects internal or external time base. The rear panel connector can be used as an input for the external time base signal, or as an output to check the internal 10 MHz time base or provide a convenient frequency standard of 1 MHz for bench use. Switch selected 120 or 240 VAC, or operation from any 12-volt DC source is possible with the IM-4100 — no extra accessories are needed. Power is applied through a rear panel connector (mating connector supplied).

The IM-4100 is an easy kit to build, with an open chassis layout, circuit board construction and wiring harness to simplify assembly. Or you can order it factory assembled and tested. Add the IM-4100 to your service bench today — dollar for dollar, it's one of the best counter values you'll ever see!

Kit IM-4100,

WARBURTON FRANKI HEATHKIT CENTRE
220 Park St., Sth Melbourne, 3205
Ph. 699 4999

Kit IM-4100

Name .....
Address .....
..... Postcode .....

GREAT CIRCLE MAP

This rather distorted looking map of the world is known as a "great circle" map or "azimuthal" map. To those used to the more conventional (and also distorted) map of the world, based on Mercator's projection, it looks quite strange and, in parts, even unrecognisable.

Its purpose is to indicate the true compass bearing from the centre of the map, Sydney in this case, to any other point on the globe. This permits a directional aerial to be correctly orientated towards a particular country or area.

If this map is compared with a Mercator map it will be seen that, along a line directly north and south of Sydney, the locations are identical. On the other hand, a line east and west of Sydney, indicates completely different localities on the two maps.

On a Mercator map a line drawn due west of Sydney (270°) would intercept Cape Town in South Africa. In fact, as shown in the great circle map, an aerial so orientated would be pointing in the general direction of Adis Ababa. For Cape Town, a bearing of 217° would be required. Stranger still, Dakar would require a bearing of 215°. Similar differences will be found if a line is drawn due east towards South America.

Great circle maps are, in theory, accurate only for the one central location for which they are drawn, in this case Sydney, although it is generally considered that, within a radius of 250km, the error will be negligible for radio communication.

In practice, considering the relatively wide acceptance angle of most practical amateur beams, it is likely that the error would not be serious at a much greater distance from Sydney.

Assemble your own Mini Scamp programs!

Once you have built the Mini Scamp, the next job is to write some programs and run them. In most cases this will have to be done the long way, using hand coding and entry. For those who haven't done this before, the following article will show you how.

by PETER LAZARUS*

Simple microcomputers like Mini Scamp can only run programs which are in the form of so-called "machine language". This is really nothing more than a string of 8-bit binary numbers, which are stored in consecutive memory locations. Most of the 8-bit numbers are code numbers representing particular instructions in the microprocessor's repertoire.

It is not all that easy for we humans to visualise a program in its machine language form, however, so programs are actually written in what is called a "symbolic language". The very simplest type of symbolic language is where two-digit hexadecimal numbers are used to represent the 8-bit machine language code numbers; as you might expect this is only slightly more convenient than true machine language.

A more convenient type of symbolic language is one where short easily remembered mnemonic words are used to represent each type of machine instruction. Words like "STR" to represent a store instruction, "LD" to represent a load instruction, and "JMP" to represent a jump instruction. A program written in this sort of symbolic language is very much easier to visualise and follow from a human point of view.

Of course after a program has been written and checked in a mnemonic language of this type, it must still be translated into the equivalent machine language code understood by the computer. This translation into machine language is known as "assembly".

With larger computers this assembly can be done by the computer itself, under the control of a specially-written "Assembler" program. Or it can be done by another computer altogether, under the control of a suitable "Cross Assembler" program.

For those with access to a larger computer, assembling programs can thus be quite easy. But for those of us who haven't got access to a larger machine, the task has to be done the long way. This article aims to show you how to do this for yourself, for Mini Scamp and other small microcomputers based on SC/MP.

First of all, you will need to write your program in mnemonic language. If you haven't done this before, I recommend that you get the SC/MP Programming and Assembler Manual published by National Semiconductor (Publication Number 4200094B). It costs around $10, but is virtually essential for serious programming—particularly if you haven't any previous experience.

The lower cost SC/MP Technical Description (Publication Number 4200079A) has some information on instruction formats, and an instruction summary, but this isn't really enough unless you have a fair amount of previous programming experience.

```
        *BINARY COUNT AND DISPLAY.

        NOP
        LDI     8
        XPAH    1
        LDI     0
        XPAL    1
LOOP    ST      2(1)
        DLY     255
        ILD     COUNT
        JMP     LOOP
COUNT   .BYTE   0
```

Fig. 1: Dr. Kennewell's counting program used here as a sample for assembly.

Both publications are available from National distributors, and also from suppliers like Dick Smith Electronics and Radio Despatch Service.

After writing a program, and before attempting to assemble it into machine language, you should take a sheet of paper and execute the program yourself, pretending to be the microprocessor. Follow each instruction in the program literally, writing the result at each step. In this way you should find any errors, and be able to correct them. It is important to remove as many mistakes as you can at this stage, as correcting them later can involve much more effort.

Now we are ready to assemble the program into machine language. To do this the operation code or "op-code" for each instruction must be found, together with the number of 8-bit words or "bytes" involved for each instruction.

To serve as an example, I will use the simple program given in the April Mini Scamp article. This is reproduced in Fig.1.

A worksheet should now be drawn on a piece of paper. The program should be copied onto it in the space on the right, labelled source code. The worksheet format is shown in Fig.2. For convenience a list of the particular SC/MP instructions used in the sample program, their opcodes and formats are shown in Fig.3.

The first task is to write the opcodes of the instructions in the Code column. At the same time the length column of the worksheet can be filled.

The first instruction is NOP. From Fig.3, we determine that the opcode for this is X'08 (meaning 08 hexadecimal) and the instruction length is 1. So put "08" in the code column, and "1" in the length column.

The second instruction is a load immediate with an opcode of X'C4 and a length of two bytes. So put "C4" in the code column, and "2" in the length column.

So far the process has been simple. The next, Exchange Pointer High (XPAH) instruction has a basic opcode of 34 and

*62 Collinson St, Keilor Park, Victoria 3033

a length of one byte. However this one is different to the previous ones. The opcode must be modified to contain the pointer register number. (When 'disp (pointer)' is shown in the Format column, the pointer register number is the one written in brackets.) For all other instructions having 'pointer' in the format shown in Fig.3, the opcode is similarly changed. In the case of Jump if Not Zero (JNZ) for example, the basic opcode is X'9C, but if pointer two is to be used, it becomes X'9E.

The instruction XPAH specifies pointer 1, so its opcode becomes X'35.

We follow the same procedure for all the other instructions in the sample program.

Address calculation is the next step. Now that we know the length of each instruction, we can calculate the starting locations or addresses of our instructions.

Address	Code	Length	Source Code

Fig. 2: (above): Suggested format of a worksheet for hand assembly of programs.

Fig. 3 (right): Op codes and formats for the instructions in the sample program, for reference.

Instruction and Format	Length	Opcode	Description.
DLY displacement	2	8F	Delay
ILD disp(pointer)	2	A8	Memory Increment and Load
JMP disp(pointer)	2	90	Jump
LDI displacement	2	C4	Load Immediate
NOP	1	08	No Operation
ST disp(pointer)	2	C8	Store
XPAH pointer	1	34	Exchange Pointer Low
XPAL pointer	1	30	Exchange Pointer High

Using the SC/MP MPU, our program should begin at address zero, as the SC/MP will automatically start here after reset is pressed.

Place zero in the address column next to the first instruction. Add the first instruction length to this to get the address of the next instruction, and so on. Note that the address must be written in hexadecimal, not decimal. The hexadecimal address can be directly keyed on the Mini Scamp address switches, while decimal values would all have to be converted.

The data can be handled in the same way as the instructions were. Next to each .BYTE we place the value shown on the right. In the example, .BYTE results in a code of 00. For decimal eleven, we would code X'0B (.BYTE 11) i.e., decimal 11 converted to hexadecimal 0B. Alternatively, .BYTE expressions can be written directly in hexadecimal, such as X'7D. And in this case, the code is the same, X'7D. After writing the code for the .BYTE locations, the address can be calculated. Each .BYTE occupies one byte—i.e., a single 8-bit memory location.

The worksheet will now look like Fig. 4. This completes the first stage or "pass" of the assembly.

The second stage is to resolve labels and displacements. Labels are the names given, for convenience, to statements or locations in the mnemonic language version of the program. The example uses two such labels, 'LOOP' and 'COUNT'. Each label appearing in the operand area has to be changed to a hexadecimal code specifying its location in memory.

Displacements when specified in the Format column of Fig.3, usually represent the change of a label to a code defining its location. Displacements can also be explicitly defined, as in the DLY instruction in the example. Here, the 255 is the displacement part of the instruction, used to specify the period of the delay.

Firstly, let's handle explicit displacements. The two LDI instructions have a displacement of 8 and 0. These each occupy one byte, and are written in the code column as 08 and 00. Instructions XPAL and XPAH do not have displacements. The '1' is the pointer register, and that has been handled previously. The 'ST' has a displacement of 02, and finally the 225 displacement in the DLY instruction has to be changed to its hexadecimal equivalent of FF.

To calculate label displacements we must distinguish between two kinds. Firstly there are the labels of data areas referenced by load or store instructions, etc., and secondly there are labels used in Jumps.

Labels used in jump instructions must be changed to a displacement corresponding to the address BEFORE the one actually required. This is because the SC/MP increments its Program Counter just before fetching the next instruction.

The rule for determining the displacement for Jump instructions is:

disp = (address of label) − 1
+ two's complement of
(address of instruction + 1)

For all other label displacements the rule is:

disp = (address of label)
+ two's complement of
(address of instruction + 1)

Although these are expressed in binary notation, it is more convenient to think in hexadecimal. To calculate the two's complement of a hexadecimal number, subtract each digit from X'F, write the result, and then add one. For example, to find the complement of X'25: 15−2=13 (X'D), 15−5=10 (X'A), giving X'DA, then add one giving X'DB.

Now let's calculate the displacement of label 'LOOP'. This is a Jump instruction, so the first rule applies.

Address of label: 0007
Address of instruction + 1: 000E
Two's Complement FFF2
Add: FFF9
Subtract 1: − 1
Result (take last two digits): FFF8

So the displacement is X'F8.

For the label 'COUNT' use rule two.

Address of label: 000F
Address of instruction + 1: 000C
Two's Complement FFF4
Add: 0003
Result (take last two digits): 03

Note that in both types of displacement calculation, if the first two digits are anything other than X'00 or X'FF, then the displacement is greater than 127, and with SC/MP a different addressing scheme must be used. Also a displace-

ment of X'80' (−128) is not to be used, as SC/MP will use the extension register for the displacement.

In these examples the pointer register is zero (none was specified in brackets) indicating the Program Counter. If a pointer register is to be used, then the address of the instruction plus one is to be replaced by the address loaded into the pointer register. This applies to both the above rules.

Now our program is fully assembled. It will look like Fig. 5. To enter into the memory, we consider only the address and code parts of the worksheet. Entering programs into the Mini Scamp was described in Dr. Kennewell's first article, in the April issue.

Lastly, a word about program alterations. If you want to change an instruction, it can be done provided the new instruction length is equal to or shorter than the original. If the length is equal, then change the hexadecimal code to reflect the new instruction. If the length is shorter, the new instruction occupies the first byte and a NOP (X'08) can be used to occupy the second byte.

To add extra instructions in the middle of a program can involve a lot of work—you have to re-assemble the whole program again! The easy way is to add them at the end of the program, and provide a Jump at the point you want them executed. Say for example we wanted to add three extra instructions after label 'LOOP' in our example. The three extra instructions would be added at the end (address X'0010). The DLY instruction can be replaced by a JMP instruction to transfer control to address X'0010.

Address	Code	Length	Source Code		
0000	08	1		NOP	
0001	C4	2		LDI	8
0003	35	1		XPAH	1
0004	C4	2		LDI	0
0006	31	1	LOOP	XPAL	1
0007	C9	2		ST	2(1)
0009	8F	2		DLY	255
000B	A8	2		ILD	COUNT
000D	90	2		JMP	LOOP
000F	00	1		BYTE	0

Fig. 4: How the worksheet for the sample program should look after op codes, lengths and addresses have been added to the source code.

We have to add the DLY back again before the three new instructions, and add another JMP at the end to return to X'000B. The program would look like:

```
LOOP    ST              2(1)
        JMP             EXTRA
RETN    IDL             COUNT
        .
        .
COUNT   .BYTE           0
EXTRA   DLY             255
        Extra instructions (3)
        JMP             RETN
```

This technique can be particularly handy for temporary repairs to a program, to get it going. Whether you leave the "patches" in permanently, or rewrite the program later to make it more elegant, is up to you.

Now it's your turn to write and assemble some programs. Try simple programs of no more than 20-30 statements at first, as you could quickly get discouraged attempting larger ones initially. You might attempt assembly of the other example given in the April issue, to check your understanding.

Address	Code	Length	Source Code		
0000	08	1		NOP	
0001	C4 08	2		LDI	8
0003	35	1		XPAH	1
0004	C4 00	2		LDI	0
0006	31	1		XPAL	1
0007	C9 02	2	LOOP	ST	2(1)
0009	8F FF	2		DLY	255
000B	A8 03	2		ILD	COUNT
000D	90 F8	2		JMP	LOOP
000F	00	1	COUNT	.BYTE	0

Fig. 5: The worksheet for the sample program when fully assembled, with all displacements added in the code column.

Resident Assembler for the SC/MP LCDS

National Semiconductors has announced the release of a line-by-line resident assembler for the SC/MP Low Cost Development System (LCDS). Known as SUPAK, the assembler comes in eight 512-byte PROMs or ROMs, which plug into a standard ROM/PROM card.

In the 4k-byte firmware package are actually three programs: a line-by-line assembler, a paper tape line editor and a PROM tape punch program.

The line assembler accepts a program written in limited SC/MP assembly language from a keyboard or paper reader, and assembles it directly into RAM. The editor allows insertion, deletion or replacement of lines in program source code, while the PROM tape punch will punch out a selected part of RAM for PROM programmers such as the DATA I/O, in appropriate format.

Priced at $300, SUPAK will be available shortly from NS distributors.

The Dick Smith—Electronics Australia Microcomputer Contest:

Started on your entry yet?

As announced in the July issue, Dick Smith Electronics and Electronics Australia are running an exciting microcomputer contest. The idea is simple—to the individual enthusiast, student or hobby club who can come up with the most intriguing and imaginative application for the Mini Scamp microcomputer, Dick Smith Electronics is awarding an outstanding prize: a complete "big brother" system valued at more than $2000, shown above. It consists of a National Semiconductor SC/MP development system complete with Tiny BASIC interpreter, an E & M Electronics video terminal complete with 12-inch TV receiver, and two Statronics modular power supplies.

We're not looking for way-out academic applications, but down-to-earth practical ways of using microprocessors in the home, office or school. Like controlling a model train layout, or running a home movie show.

The system you develop must use Mini Scamp, and its software must fit in less than 1280 bytes of RAM and/or ROM/PROM. It should preferably have been tried out in practice, to make sure there are no hidden bugs. Your entry should include a detailed description of system operation, a complete program listing with comments, and details of any custom interfacing you have used.

Judges for the contest winner will be Mini Scamp's designer Dr John Kennewell, entrepreneur Dick Smith and EA editor Jim Rowe. Their decision will be regarded as final.

Entries must be accompanied by the official entry form below (except in states where this requirement is illegal). Entries should be postmarked no later than September 30th, 1977. The winner will be announced in EA as soon as possible after that date.

CONDITIONS OF ENTRY: Entries should represent the entrant's original work. Employees of Sungravure Pty Ltd, Dick Smith Electronics Pty Ltd or any associated companies are not eligible to enter. Entries postmarked or delivered by hand later than September 30, 1977, will not be eligible.

ENTRY FORM

THE DICK SMITH–ELECTRONICS AUSTRALIA MINI SCAMP $2000 MICROCOMPUTER CONTEST

Complete this form and attach it to your entry, posting them not later than 30th September, 1977, to Microcomputer Contest, c/o Electronics Australia, Box 163, Beaconsfield, NSW 2014. A letter may be used instead of the form in States where this requirement is illegal.

NAME .....

ADDRESS .....

..... **POSTCODE**.....

Using Mini Scamp to generate random numbers

Here is another article by the original designer of the Mini Scamp project, this time to help you become proficient at programming. It explains how a computer may be used to generate random and pseudo-random numbers, and gives a Mini Scamp program which demonstrates pseudorandom number generation.

by DR JOHN KENNEWELL
Physics Department, Newcastle University

A program that generates a sequence of random numbers finds many applications in the world of computing. Such programs were used in one of the first electronic computers ever constructed, at the Los Alamos laboratories during the second world war. Here, a technique known as 'Monte Carlo simulation' employed random numbers to calculate the critical masses of uranium or plutonium needed for a nuclear explosive device.

Many games programs employ random number generators. These enable a computer to simulate the tossing of a coin, the throwing of dice, or the choosing of a card. To a certain extent random number generators can be used to make a computer appear more intelligent, or perhaps we should say more human. This is achieved by having not one, but a list of possible responses to any given situation, and then using a random number to decide which of these responses will be actually given at any particular time.

In larger computers most random number programs use the mathematical expression

$$R_{n+1} = (P \times R_n) \text{ modulo } Q$$

to generate a sequence of random numbers. R_n is the last random number calculated, and this is used to produce the next random number R_{n+1}. To start with, R_n can be put equal to any number, and this number is termed the 'seed', from which all later numbers will 'grow'. P is a suitable prime number and Q is usually 2^N where N is the number of bits per word in the computer (e.g., N = 8 for Mini Scamp). The expression 'modulo' means that the product $P \times R_n$ is divided by Q and only the REMAINDER is retained. For example 9modulo5 = 4 or 7modulo3 = 1. This type of modulo division is done very simply if $Q = 2^N$ by simply ignoring the fact that overflow has occurred in the multiplication of $P \times R_n$.

The above procedure, while quite simple, and not impossible to program for Mini Scamp, does require a multiplication routine, which could use up a considerable number of memory locations. An alternative random number generator can be obtained by simulating a shift register with feedback (see Fig. 1). Starting with any number except zero in the shift register, the next number in the sequence is obtained by shifting all bits in the register one place to the right. Bit 7 will be lost, and bit 1 is formed by EXCLUSIVE-ORing bits 6 and 7 (termed the feedback bits) of the initial number. Following numbers in the sequence are generated by simply repeating the above procedure.

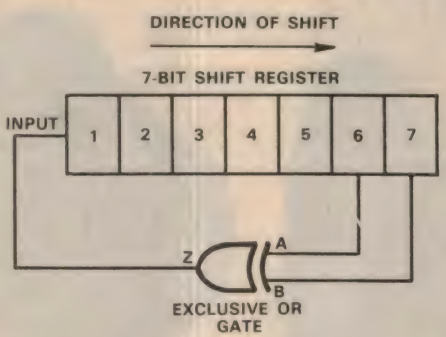


Fig. 1: A 7-bit pseudorandom sequence generator as implemented in hardware.

In point of fact the above method does not produce truly 'random' numbers. It would be more correct to say that it generates a pseudorandom sequence of numbers, because given any starting number, the sequence will always be fixed. In the case of a 7-bit register, the sequence will consist of 127 different numbers before it then starts to repeat.

It turns out however, that such a pseudorandom sequence is more useful in programming than a truly random sequence, particularly when first testing a program. Imagine testing a program that uses totally RANDOM numbers. Every time you ran it, you would obtain different results. Under these conditions it would be very difficult to tell whether the differences were due simply to the random numbers, or to a fault in your program. With a pseudorandom sequence you know that, as long as you start with the same 'seed' number each time, the results will be repeatable.

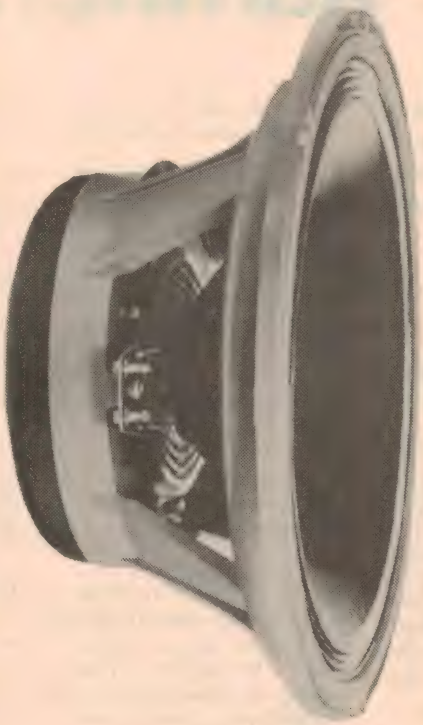
As long as the sequence is made large enough, a limited number of values from the sequence will always appear random. The randomness of such a sequence can also be increased by considering only a smaller number of bits than are used in the shift register (e.g. the lower 8 bits of a 15-bit register).

A program to implement the above-mentioned procedure is given here for the Mini Scamp. The accumulator is used as the shift register. Excluding the NOP instruction, the next four instructions are concerned with loading pointer register one with the base address for the LED's (X'0800). In this way, each random number generated can be displayed on the front panel. The next instruction loads the accumulator with the seed number which has been planted in location 'X0028, and as long as this is not zero the

INPUT A	INPUT B	OUTPUT Z
0	0	0
0	1	1
1	0	1
1	1	0

Here is the truth table definition of the exclusive-OR function, for reference.

Watts new from Celestion...



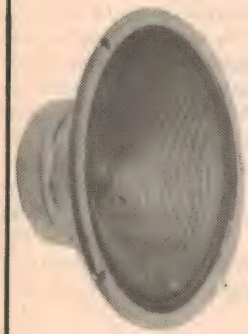
These new additions to our already extensive range present an even wider choice for manufacturers of amplification or P.A. systems.

The G.12/75 range offers a choice of three alternative speakers. One is the 'Standard' which caters for lead guitar requirements. Second is the cambric–edged version for low resonance applications and thirdly the twin-cone model for PA roles.

Powercell 12 and 15 – with a specially designed rear back-pressure ventilation system and a cambric-edged, plasticised cone – are ideally suited for heavy duty use, allowing long periods of high power, low resonance without fatigue and providing exceptionally high sound quality.

HI-CEL assemblies are designed for use where middle/high frequencies require boost, employing two of the proven MH1000 horn loaded pressure units.

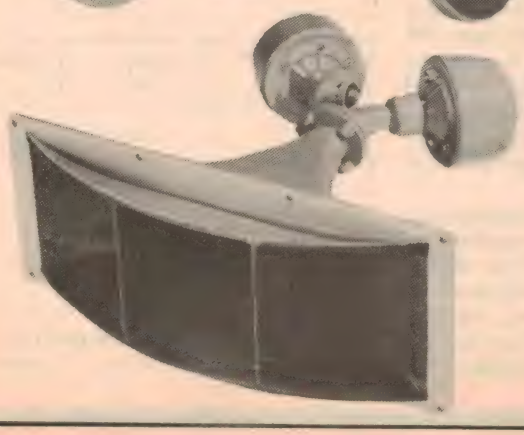
An entirely new range of leaflets, covering the Power Range and P.A. will be available shortly to assist manufacturers and installers to specify the most suitable product for any specific application.



G12L
G12S
G12M
G12H

G15C

G18C



Sole Australian and New Zealand Distributors

M & G HOSKINS PTY. LTD

Showroom, 400 Kent Street, Sydney 2000.
Phone 559 4545, 559 3693

Celestion

Shift Register Length (bits)	Feedback Bits	Sequence Length
3	2,3	7
4	3,4	15
5	3,5	31
6	5,6	63
7	6,7	127
8	2,3,4,8	255
9	5,9	511
10	7,10	1023
11	9,11	2047
12	2,10,11,12	4095
13	1,11,12,13	8191
14	2,12,13,14	16383
15	14,15	32767
16	11,13,14,16	65535

Fig. 2 (left): how to make pseudorandom generators using shift registers of different lengths.

At right is the listing for the author's program to duplicate the function of the circuit of Fig. 1.

```
                        *RANDOM NUMBER GENERATOR
0000 08                 NOP
0001 C400               LDI   0
0003 31                 XPAL  1
0004 C408               LDI   8
0006 35                 XPAH  1
0007 C020   RANDOM      LD    RND
0009 9C02               JNZ   START
000B C401               LDI   1
000D D403   START       ANI   X'03
000F 9808               JZ    ZERO
0011 FC02               CAI   2
0013 9404               JP    ZERO
0015 C480               LDI   X'80
0017 9002               JMP   FIN
0019 C400   ZERO        LDI   0
001B D80C   FIN         OR    RND
001D 1C                 SR
001E C809               ST    RND
0020 C902               ST    2(1)
0022 8FFF               DLY   255
0024 8FFF               DLY   255
0026 90DF               JMP   RANDOM
0028   43   RND          BYTE  67
```

bit to be fed back to bit 1 can then be computed. If however, the seed is zero, a 'lock-out' condition will occur, as the EXCLUSIVE-OR of 0 and 0 is always 0. To avoid this possibility a value of 1 is thus placed in the accumulator.

The ANI X'03 instruction is now used to mask off all bits except 6 and 7, the lowest significant bits, as these are the feedback bits. Note that the most significant bit of the accumulator is ignored as far as the random numbers are concerned, leaving the 7 lower bits as required.

After the mask has been applied, the accumulator may contain any number from 0 to 3 inclusive. If it is zero, then the new bit one will be zero (JZ ZERO). If 2 is subtracted from the accumulator (CAI 2) and the result positive (initial number would have been 3 in this case) then the bit fed back will again be zero (JP ZERO). If neither of these conditions is true, then either bit 6 or bit 7, but not both, would have been one, and the bit to be fed back should be one. This bit is loaded temporarily into the most significant bit of the accumulator (either by LDI X'80 or LDI 0, whichever is appropriate) OR'ed with the original random number (OR RND) and then shifted right (SR) one place.

The newly created number then replaces the old random number in location X'28 and is also displayed on the LED's (ST 2(1)). The delay instructions slow the sequence down sufficiently for you to observe what is happening.

If you wish the program to stop after each new number generated, then replace the second delay instruction at location X'24 by the instruction LD 1(1) which has the hex code C101. This will cause the machine to hold with the DRQ light turned on until you press the deposit button. What you deposit into the accumulator is unimportant, as it is ignored by this program. Using this method you can either write out the complete sequence, or simply determine mentally what the next number in the sequence should be, and then press deposit to test your prediction.

You will probably note that if you keep your finger on the deposit button, the machine as originally described will continue to sequence as before (actually faster, since one delay has been omitted). Thus, if you only want one number at a time, you must depress and release the deposit button quickly (in less than one-quarter of a second). The reason for this behaviour is that, with deposit activated, the mono in the circuit will be continuously enabled, and if the SC/MP CPU requests a new data value (as it will each time around the program loop), it will have one provided it immediately without having to go into the hold state. This won't happen however, if you have modified your Mini Scamp as shown in the July issue.

It is possible to write a similar program to simulate shift registers of any other length desired. Fig. 2 shows the appropriate feedback bits to use, and the length of the sequence generated for other length registers. After becoming familiar with the program presented here, you might like to try your hand at a program for a longer sequence.

A register length of 15 is quite easy to implement using two 8-bit words. The word containing the lower 8 significant bits is subject to exactly the same test as the for the 7-bit register. However, the bit to be fed back is placed in the MSB of the word containing the higher significant bits. Then after clearing the carry/link (CCL), a rotate right with link (RRL) is performed on this word, causing the LSB of the word to be shifted into the carry/link register. If now a shift right with link (SRL) is performed on the other word, this bit will be shifted into this lower word. The procedure is illustrated in Fig. 3. In this way it is possible to simulate a register of any length whatever.

In actual use, a program such as this would be written as a subroutine in part of a larger program. Each time the main body of the program called the subroutine, it would calculate a new random number for use by that program. In many cases, only a yes/no type decision may be required, and thus only one particular bit of the random number need be considered.

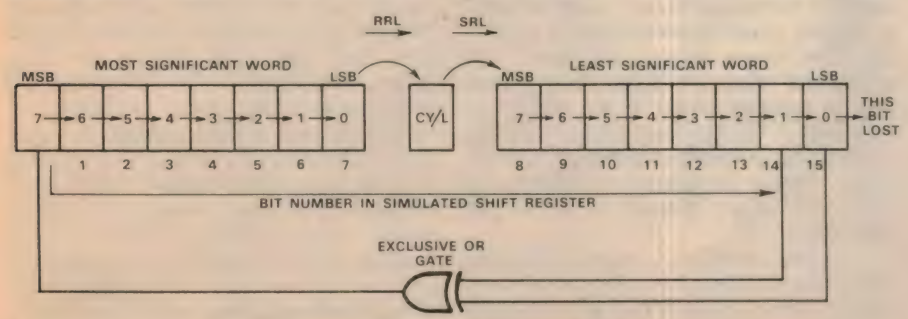


Fig. 3: Suggested way of simulating a 15-bit sequence generator.

Classical Recordings

Reviewed by Julian Russell

Sibelius: "wonderfully condensed score"

SIBELIUS—Symphonies Nos. Four and Five. Royal Philharmonic Orchestra conducted by Loris Tjeknavorian. RCA Stereo LRLI 5134.

Sibelius' Fourth Symphony, perhaps his greatest, is a stern work—one might even call it dour. There is not a spare note in its wonderfully condensed score. The orchestration is economical almost persimonious though marvellously effective. But to examine the score is to wonder at its apparent simplicity, a feature that is almost a constant in Sibelius' writing.

Tjeknavorian's reading differs in detail from the interpretation in Kajanus' famous prewar 78 series and those of such famous Sibelians as Beecham, yet it is eminently acceptable. For example his first movement is slightly faster than that of either of the conductors mentioned above but everything is under the tightest control.

In the second movement, though Tjeknavorian is careful not to score any cheap theatrical effects, I felt that an occasional point could have been made with slightly more emphasis. But however this conductor might differ from rivals his differences cannot be logically challenged except on the most subjective lines. And this applies even to his unusual preparation for the great climax in the slow movement.

The Finale is slightly slow in tempo compared to other performances of note, but never staid. And here, too, you will find some unusual understatement. But, despite the performance's occasional departure from what you might have become used to listening to, it is a grand Fourth just the same. The sound is beautifully clear, and one is able to follow, without aural strain or resource to a score, the composer's sometimes many stranded polytonality.

The Fifth Symphony is played here in the 1919 version, a revision by Sibelius himself and now regarded as the definitive one though he made still another revision some years later. It would be worth students' while to see if they can find a copy of the first version and to compare it with the other versions that followed.

The Fifth is perhaps the most popular of Sibelius' seven symphonies, at any rate judging by the reception it has always received at the many performances of it I have attended. It is indeed probably Sibelius' most popular work if one excludes Finlandia and Valse Triste, which though both short are never trival. The Fifth's popularity is probably due to its more orthodox form—though even this has many surprises—and to the mounting splendour of its final overwhelming climax.

BRAHMS — Violin Sonatas No. 2 in A and No. 3 in D Minor. Arthur Grumiaux (violin) and Georgy Sebok (piano). Philips Stereo De Luxe 9500 109.

This is in every way a beautiful production, beautifully played and most faithfully recorded. That illustrious violinist Arthur Grumiaux has found a splendid partner in Georgy Sebok and this is especially important when one remembers that Brahms called these works Sonatas for Piano and Violin.

Those whose expectations were high when they recalled Grumiaux' seraphic recordings of the Beethoven Violin and Piano Sonatas of many years ago will not be disappointed in his treatment of these of Brahms'. All through both works the players retain a balance as perfect as their temperamental rapport.

I know of only one competitor in the same class — Katchen and Suk, another superb performance. Which of the two you will prefer will be strictly a matter of your own personal choice. My previous reviews of pretty well everything Grumiaux has previously recorded advertise my admiration of his lovely tone and faultless technique always controlled by a deeply musical intelligence which, however, never impairs his warmth of emotional response, often even mounting to passion. Listen to the fire in the opening of the D Minor Sonata and the contrasting caressing of other parts of the work. Sebok responds constantly to Grumiaux' every change of mood and vice versa.

I cannot imagine a more rewarding recording of these two sonatas appearing for some considerable time though, of course, one never quite knows for sure. But whatever the chances of a rival of equal elegance, I personally wouldn't hesitate to acquire this one.

ELGAR—Symphony No. 1 in A Flat. The Scottish National Orchestra conducted by Alexander Gibson. RCA Stereo LRL15130.

Some of Gibson's tempos may sound a little fast to listeners used to older recordings. They might even think them fast enough to rob the work of a little of its majesty, especially in the first movement. Particularly to be admired is the fleet quiet accuracy of the Scherzo. The Scottish string tone is fine and the general playing excellent. The engineering is on the whole satisfactory, though in loud passages it occasionally sounds a bit congested in the middle register.

The performance faces stiff competition from other recordings of the symphony by Boult, Barbirolli and, yes, even Hungarian-born Solti. So you see you don't have to be English to conduct English music well. And it is just as well to remember that two of Elgar's earliest and most enthusiastic admirers were Hans Richter and Richard Strauss. Gibson's is a good performance, but at its price I think I would prefer one of the other three mentioned above if they are still available.

★ ★ ★

TCHAIKOVSKY — Francesca da Rimini. Tone Poem for Orchestra. Romeo and Juliet. Tone poem for Orchestra. Boston Symphony Orchestra conducted by Charles Munch. RCA Victrola Stereo VICS-1197.

This is a very useful reissue at a budget price. Munch was an uneven conductor. I once heard him in Paris conduct a French orchestra in a Debussy programme in a way that lacked all subtlety. Yet on a good day he could be quite thrilling to listen to.

He is having one of his good days during his recordings of these two pieces. His treatment of both works is non-sentimental without the sacrifice of any emotional intensity. The playing is very clean and the engineering (1966) quite impressive, even by present day standards.

The opening chords of Francesca always give me an eerie feeling — as I imagine they were intended to by the composer. They remind me of the tag line in a late 19th century play by Stephen Phillips: "I never knew the dead could have such hair." The play, by the way, was called Paolo and Francesca and Phillips wrote little else of any merit.

After these chords comes the customary Tchaikovsky turmoil. This applies to both tone poems which have such a strong family likeness that they could be twins — not the identical sort but twins just the same. Perhaps this is one reason why the two works are so seldom coupled. But the combination comes off very well here.

There is also the added attraction that Francesca gets far fewer concert performances than Romeo. Yet it has its own

very individual beauty despite its similarity of structure.

In Francesca you will have to pay careful attention to the gain. Set normally so that the fortissimo passages are satisfactorily loud without annoying anyone in the next street, the clarinet solo at the beginning of the slow section is almost inaudible, so wide is the dynamic range. The tone is good, always sharp edged in the more turbulent reaches of the score, and when necessary the strings can put on plenty of bloom. There is some beautiful woodwind solo playing though at times they do seem to have an acoustic of their own.

Everything I have written about Francesca can be taken almost exactly for Romeo. I consider this a very good buy at its budget price.

★ ★ ★

CHOPIN—24 Preludes, Op. 28. Prelude in C Sharp Minor, Op. 45. Prelude, Op. Posthumous. Daniel Barenboim (piano). EMI Stereo OASD3254.

The usually excellent Barenboim has nowadays started to become a little uneven in the quality of his recorded piano performances. Thus he seems to have done little exploration to find his own man in these 24 Chopin Preludes. Some sound so cursorily disposed of that he might have been sight reading them. In some of the fast ones, he has a tendency to jumble passages that I found quite astonishing when I recalled the accuracy of his technique a few years ago.

I am afraid that with so many outstanding competitors in this richly exploited field I cannot recommend this new set of Preludes. Nor would I class the engineering as out of the top drawer. I feel sad about my lack of enthusiasm all the more because of the strength of my admiration for him in so many of his previous recordings, instrumental and orchestral. He can still play quite wonderfully, but these occasions now have to be sought with patience.

★ ★ ★

SCHUBERT — Symphony No. 8 in B Minor (Unfinished). Symphony No. 5 in B Flat. Chicago Symphony Orchestra conducted by Fritz Reiner. RCA Victrola Stereo. VICS-1639.

This is another Victrola reissue dating back to 1962 in origin but which I cannot recommend with the same enthusiasm as the Tchaikovsky. I think most readers will agree with me that they are very strange readings to come from a conductor who did so much to improve the Chicago Symphony in his time.

The engineering still sounds respectable, but without the subtleties of balance that can be achieved with more recent techniques. As to the placing, parts of the first movement are much too heavily romanticised and the difference in character between the two main themes much too emphatic. Reiner was a fine conductor but from the evidence provided by these two Schubert symphonies Schubert was just not his cup of tea. You cannot heat up Schubert's emotion to the incandescent temperature of say Tchaikovsky's.

The playing throughout both works is, of course, very good indeed. But the solo flute's breathy tone becomes a bit tiresome after a while. The second movement of the Unfinished is preferable to the first, at least to me, but even at its Victrola price I still cannot recommend it.

I liked the Fifth even less, though the playing was again undoubtedly good. The slow movement and the Scherzo come off all right but the absurd haste in the first movement troubled me mightily. At the pace it is taken by Reiner it loses all sense of geniality — indeed it is hard to find geniality anywhere in his reading of this delicious little symphony.

Reiner's playing of the slow movement does make a delightful contrast though. The scherzo goes well, the rhythm not too heavily accented, although it seems to lose its character in the Trio. The Finale is spirited, but for my taste a little too matter of fact. As the bookmakers say: "You'll do better."

★ ★ ★

STRAVINSKY—Octet for Wind.
WEBERN—Quartet, Op. 22.
DAVIDOVSKY—Synchronism No.2.
BERHARD—Libra. The Australian Contemporary Musical Ensemble Vol. 1, directed by Keith Humble. Cherry Pie Stereo CPF1029.

For my personal taste, which derives little if any satisfaction from avant garde music, most interest in this 1st class production is in the high standard of playing and recording of the enterprising disc. It is somewhat sinisterly labelled—for me anyway—Volume 1, but if those to follow are of the same quality they should be of vast interest to those interested in contemporary music.

The first item, Stravinsky's Wind Octet which dates back to 1922/3, sounds quite mellifluous nowadays. Even to the most conventional mind there is only what sounds like an occasional eccentricity and there is not even any difficulty in following the fugato which sounds as simple as a two-part invention. Moreover, in the early part of the second movement Stravinsky is unusually generous with the width of his intervals, which he avoided in miserly fashion for most of his musical life.

The second item is Webern's fragmented Quartet, Op. 22, a work that can be admired for the beauty of its construction if for nothing else. This one is strictly for enthusiastic supporters of the Second Viennese School, of which Webern was an influential member, and which was responsible for the disintegration of contemporary music. It is made up of wisps of sound, every form used quite wonderfully miniaturised. To me it doesn't sound like music but rather a mathematical exercise in sound.

Davidovsky's Synchronism is also fragmented, though a little more explicitly and not as fastidiously as the Webern. He combines short interjections with quite long phrases. There are some paramusical sounds as if stringed instruments were being struck with the wooden part of the bow.

Gerhard's Libra is a little more musical, in the old fashioned use of the word, than the previous two pieces, though not many would label his work beguiling.

Cherry Pie must have been in a brave mood when they undertook to produce this series. But even those who do not enjoy, or even approve of this type of composition, cannot fail to recognise the skill of its performers and the fine polish on the whole production.

J.V.C. SPEAKER KIT
3-WAY

$$$$ (Incredible Saving) $$$$

BUILD YOUR OWN LOUDSPEAKERS $59.00 EACH

You can assemble this system yourself without tools in less than an hour. Contains absolutely everything you need – even glue! The system incorporates a 200 mm woofer, 50 mm mid-range and 50 mm tweeter as well as a high frequency level control. Wooden finish cabinet with contemporary orange acoustic cloth.

EASY TO ASSEMBLE

You SAVE money because you do the assembly.

SPECIFICATIONS

Power Handling .....25 Watts RMS
Frequency Response.....40 - 20,000Hz
Impedance 8ohms
Crossover Frequency..3kHz-10kHz
Dimensions..456mm(H)x253mm(W) x205mm(D)
Net Weight..... 5.4kg

Cat. C-2638

DICK'S VALUE PLUS SPECIAL

SAVE $51.50

~~169.50~~

$118.00 PER PAIR.

Complete with Contemporary Orange Baffle

DICK SMITH ELECTRONICS GROUP

VISIT YOUR NEAREST STORE:
SYDNEY – 125 York St, Ph. 29 1126
BANKSTOWN – 361 Hume Hwy. Ph. 709 6600
GORE HILL – 162 Pacific Hwy. Ph. 439 5311
MELBOURNE – 656 Bridge Rd, Richmond. Ph. 42 1614
BRISBANE – 166 Logan Rd, Buranda. Ph. 391 6233
MAIL ORDERS: P.O. Box 747. Crows Nest, N.S.W. 2065.
AND NOW OUR NEW STORE AT PARRAMATTA: 30 GROSE ST – Ph. 683-1133
ALSO AVAILABLE AT DEALERS THROUGHOUT AUSTRALIA

DSE71EA87

POSTAGE/PACKING CHARGES

ORDER VALUE	CHARGE
$5 – $9.99	$1.00
$10 – $24.99	$2.00
$25 – $49.99	$3.00
$50 – $99.99	$4.00
$100 or more	$5.50

Lighter Side

Reviews of other recordings

Devotional Records

REACH OUT. Bill Pearce, Trombone. Stereo, Word WST-8663-LP. (From Sacred Productions Aust., 181 Clarence St., Sydney and other capitals.)

The connection is a little obscure but the jacket notes refer to a syndicated radio program "Night Sounds", also featuring Bill Pearce, the well known American Gospel musician. It does not specifically say that the tracks here are as arranged for that program but I imagine that they are – with a style which is quite deliberately varied (contrived?) but always aimed at a middle-of-the-road audience.

Bill Pearce features prominently on trombone, sometimes in sparse instrumental combinations, sometimes with orchestra, sometimes with chorus and, in a couple of spots, aiming for a purely novelty effect.

The track titles: He Never Sleeps – Guide Me, Oh Thou Great Jehovah – Joshua Fit The Battle Of Jericho – In The Sweet Bye And Bye – I Want You To Know – Reach Out And Touch – What Wondrous Love Is This? – In This Quiet Moment – Here Comes Jesus – I'll Be A Sunbeam & A Happy Heart (medley).

It's not thrusting Gospel, it's not serious music or even systematic musical "wallpaper". It's just Bill Pearce and his group "doing their thing", radio style, with an overtone of soft-sell Gospel. If your're a radio listener from way back, you'll enjoy it. (W.N.W.).

★ ★ ★

FLOW RIVER FLOW. Erick Nelson. Stereo, Maranatha HS-028. (From S. John Bacon Publishing Co., 13 Windsor Ave., Mount Waverley, Vic. 3149.)

With a group of backing vocalists, plus keyboards, drums, guitars and bass, Erick Nelson brings a program of what are predominantly his own compositions. They speak of his basic faith and of the needs of people in his life – in particular a seriously invalided younger brother, and what he refers to as "the wheelchair gang" in the Calvary Chapel, whose acquaintance he has made.

There is a highly personal quality about the compositions, as set out on an accompanying word sheet, but this tends to be the style of the new generation of Gospel singers, as distinct from the "preaching" hymns of an earlier era.

The titles: Flow River Flow – Soldiers Of The Cross – Prelude – The Gift – Sunlight – Something Happened To You – Movin' On – Beside You – One Last Night – Prodigal's Return.

The compositions are modern in style and arrangement, for the most part against a driving beat, extending sometimes to soft rock. It's all very competent and relevant to the youth Gospel scene. Certainly worth a hearing if you're in the process of building a library of modern Gospel music. (W.N.W.).

GENTLE FAITH. Maranatha Music, Maranatha stereo HS-027. (From S. John Bacon Publishing Co, 13 Windsor Ave., Mount Waverley, Vic. 3149.)

From the imitation parchment sleeve and the title, one might assume that this album also contains gentle music. To the rising generations, nurtured on hard rock, it might even seem so but to older ears it will simply be: rock.

I should also make one other point: with many mod. Gospel records, the artists and producers go to some length to make sure that the listeners can follow the lyrics. Here, all the emphasis is on the music and, if you don't know the lyrics, mostly you'll have to guess what it's all about from the titles and a few odd phrases that manage to come through: Simple Song – Living In The Sonshine – The Whole Lump Of Dough – It's So Good To Know – Jerusalem – Noah – My Love For You – Goin' Back Home – Turnaround – Home.

An imported album, recorded in California, the quality and surface is right up to standard and the artists, as named and pictured are very capable. Whether you respond to their efforts would depend on what you expect from a Gospel album. (W.N.W.).

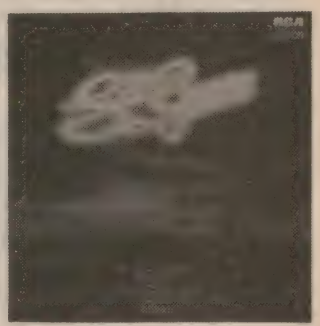
Instrumental, Vocal and Humour

THE SNOW GOOSE. Narration by Spike Milligan, with the London Symphony Orchestra conducted by Ed Welch. Stereo, RCA Victor VPL1-7123.

As the jacket notes point out, the story of the Snow Goose emerged as Paul Gallico's tribute to the brave, ordinary people who risked everything to rescue soldiers of the British Expeditionary Force from the beach at Dunkirk. But, in contrast to the intrinsic violence of this historic event, the Snow Goose is a gentle, human story about a lonely hunchback, a shy waif of a girl and a white snow goose which they jointly nursed back to health after it had been wounded by a shooter's bullet.

And, if the story comes as a surprise to those who are not already familiar with it, you will be in for another with the role of Spike Milligan who collaborated closely in the creation of the album. He provides a narration which complements with great feeling its low-key but eloquent protest against human violence.

The music by Ed Welch, who also conducted the L.S.O., is likewise gentle, with touches of humour at the antics of the snow goose and a muted but unmistakable contrast between the loneliness of the Essex moors, and the military violence just across the Channel.



I enjoyed listening to the album and I think you will, too. How many times one would choose to play it again in the home is another matter but, then, the same kind of consideration doesn't seem to have dimmed the popularity of "Peter and the Wolf".

I'd recommend investing in a copy! (W.N.W.)

★ ★ ★

GRADUATION BALL, INVITATION TO THE DANCE DIE FLEDERMAUS. Overture and Ballet Music. Decca SPA 406.

Here is another in the delightful Decca "World Of Great Classics" series that brings to the listener selected recorded versions of well known works.

The Vienna Philharmonic is under the direction of Willi Boskovsky and Herbert Von Karajan, which should itself be a guarantee of performance.

Reviews in this section are by Neville Williams (W.N.W.), J. Rowe (J.R.), Leo Simpson (L.D.S.), Norman Marks (N.J.M.) and David Edwards (D.W.E.).

THE LIGHTER SIDE

All of side one and part of side two are taken with Johann Strauss's "Graduation Ball" ballet, followed by Weber's "Invitation To The Dance", used as the score for the ballet "Le Spectre de la Rose". Then follows the overture and ballet music from "Die Fledermaus" by Johann Strauss. As usual with this series, the sleeve notes are most detailed, with historical information about the music and the composers. This series would be an excellent foundation for anyone wishing to build up a classical library. (N.J.M.).

★ ★ ★

DINING & DANCING Volume 2. Reubert Hayes, Organ. Stereo, M7, MLX-149.

As with Volume 1, reviewed a short while ago, this recording was made on the Conn 544 installed in the Salamanda Hotel/Motel at Port Stephens in NSW. While it was made about the same time as Volume 1, I wouldn't be at all surprised if it emerged the more popular of the two. It struck me as a more relaxed performance and, while there is still a lot of strict tempo sound for dancing, the effect of the beat is less constrictive.

There are ten tracks altogether, mostly medleys and only some of the titles are mentioned to give you an idea of the contents: Arrivederci Roma – Love is Blue – Say It With Music – I'll Step Down – Mona Lisa – That's Amore – The Wedding – Love Story – Never On Sunday – Tea For Two – I Belong To Glasgow – After The Ball – La Cumparsita – Pass Me By – Hello, Hello, Who's Your Lady Friend – I Do Like To Be Beside The Seaside.

In fact, looking down the titles on side 2, they are strongly reminiscent of Reginald Dixon and his Blackpool Ballroom Wurlitzer, but scaled down to an electronic Conn in a hotel dining room! Quality is normal and playing time about 38 minutes. (W.N.W.)

★ ★ ★

KALEIDOSCOPE OF RAINBOWS. Neil Ardley. Stereo, Gull (Astor) GULP-1018.

Composer Neil Ardley explains in his jacket notes how this group of titles grew out of his "toying endlessly" with the simple 5-note Balinese scale, known as the Pelog scale. The performance is a mix of careful scoring and of improvisation and has elements of both jazz and rock, provided by about thirteen musicians playing both traditional and amplified instruments, plus one or more synthesisers. The tracks are nine in number, opening with "Prologue", followed by "Rainbow One" through to "Rainbow Seven", and concluding with "Epilogue".

Derek Jewell, jazz and popular music critic of the "Sunday Times" contributes

lengthy comment on the jacket and is unsparing in his praise of Neil Ardley's work. My own reaction is to sound a note of caution to the uninitiated. If you merely want to put a record on the turntable in the expectation of some undemanding, easy-on-the-ear music, "Kaeidoscope of Rainbows" wouldn't be for you. Its appeal will be to those who, like Derek Jewell, want to listen carefully what Neil Ardley is up to, in the musical sense. In other words, it's the kind of music you need to work at, to discover what it has to say.

Technically, the quality is well up to standard. (W.N.W.)

★ ★ ★

25th ANNIVERSARY REUNION. The Dave Brubeck Quartet. A&M stereo L 36174. Distributed by Festival Records Pty Ltd.

Brubeck fans will be delighted. Finally, we have had a local release of a recording of the 25th anniversary reunion of the Dave Brubeck Quartet. On the road again, 25 cities in 25 nights. In its heyday, the DBQ was "the world's best-paid, most widely-travelled, most highly publicised and most popular small group (now) playing improvised syncopated music". So said a "New Yorker" review at the time of the tenth anniversary in 1961.

In December 1967 the DBQ broke up, supposedly for all time. Since then, it has lived on via records. Then, in 1976, they were back together again for a short concert tour. This album was recorded at one of those concerts (except for one track which was recorded at a separate concert).

No doubt it will become a collector's piece. In the meantime, it is a lot of fun with the famous quartet putting all they've got into some of their old standards.

Tracks featured are: St Louis Blues – Three To Get Ready And Four To Go – African Times Suite – Salute to Stephen Foster – Take Five – Don't Worry 'Bout Me. Recording quality is good. Highly recommended. (L.D.S.)

★ ★ ★

TOM JONES SINGS 24 GREAT STANDARDS. Decca stereo 2-record set SKLA 7715/6.

Ever since he sang "Green Green Grass Of Home" Tom Jones has been noted for the amount of energy and feeling he puts into every song. Here he does full justice to 24 songs, including some which do not really suit his style. Recording quality is okay.

Highlights of the 24 tracks include: Green Green Grass Of Home – Fly Me To The Moon – Spanish Harlem – I'll Never Fall In Love Again – With These Hands – The Nearness Of You – My Foolish Heart. (L.D.S.)

★ ★ ★

THE SINGING ACTORS OF HOLLYWOOD. Capitol stereo SENC 10346/7.

Some albums do not look very promising and this 2-record set is one of them. But I was pleasantly surprised—it is quite listenable and interesting. At least that's what I thought after playing the first few tracks. But after listening to the whole four sides I had to concede that most of Hollywood's offerings have been—and are best—forgotten, as singers. In fact, with that thought in mind, I'll forget the whole album! (L.D.S.)

THE LIGHTER SIDE

A BELLYFULL OF LAUGHS. Various comedians. M7 records MLF 180.

It is safe to say that you can see the cream of English comedians on television. This album presents an opportunity to hear some of the others and some of the TV comedians in their lesser moments. In my lounge room, they didn't sound funny.

One of the least funny tracks was called "Costa Unganda" and was a send-up of Idi Amin. Most people now realise that Idi Amin is not a laughing matter. Nor is much of the other material on the album. (L.D.S.)

★ ★ ★

MISTY BLUE. Lenny Dee, organ with orchestra. Stereo, Astor MCA-2236.

Once again, organist Lenny Dee credits everyone in the predominantly string orchestra which backs him, without mentioning his own role in this very pleasant recording. He provides organ lead of course, but the solo voices are so blended with the orchestra that, for a proportion of the time, one is not actively conscious of the organ's role in the total sound. The track titles:

This Masquerade – Misty Blue – Get Closer – Like A Sad Song – Goofus – Crazy, Crazy – Funny How Time Slips Away – Sunrise – You'll Never Find Another Love Like Mine – Let Your Love Flow.

All told, it's a very melodic sound that is equally successful turned down for background or up for kicks. And what's more, its completely clean in terms of sound quality. I guess that adds up to a recommendation for anyone who likes easy-on-the-ear middle of the road sound. (W.N.W.)

★ ★ ★

WOODY GUTHRIE'S "WE AIN'T DOWN YET". Cream Records CR 1002 Astor release.

Woody Guthrie could be described as the high priest of American Folk idiom in recent years and this tribute to his music and philosophy by some of his family and friends shows some of the reasons why. With the exception of the last track, the narrative segments are spoken by Jess Pearson. While the sing-

GREAT GUITARS: Charlie Byrd

GREAT GUITARS. Charlie Byrd, Barney Kessel, Herb Ellis. Interfusion stereo L 36171. Distributed by Festival Records Pty Ltd.

Anyone who is an admirer of guitarist Charlie Byrd should not miss this album of Byrd playing in a guitar trio, together with backing from Byrd's regular rhythm section, Wayne Phillips on drums and Joe Byrd on Bass. They swing through a good selection in fine style. Record quality is okay.

Ten tunes are featured, three in medley form: Lover – Makin' Whoopee – Body And Soul – Cow Cow Boogie – Amparo – Outer Drive – On Green Dolphin Street – Nuages – Goin' Out Of My Head – Flying Home. (L.D.S.)

---

ing is by about twenty assorted artists, including Arlo Guthrie and Ramblin' Jack Elliot with James Seals and Dash Crofts contributing the last track.

The titles include: Union Maid – Deportee – So Long It's Been Good To Know You – The Great Historical Bum – This Train Is Bound For Glory – Goin' Down The Road.

If you appreciate the man's ideas in prose and music, the record would be a must; quality is good. (N.J.M.)

★ ★ ★

SWEET BIRD, Lani Hall. A&M L 36102 Festival release.

Lani Hall has a sure, almost forceful vocal style which she demonstrates on the nine tracks on this interesting record of mainly sad songs with these titles: Send In The Clowns – That's When Miracles Occur – Early Mornin' Strangers – Mr. Blue – Too Many Mornings – At The Ballet – The Moon Is All Alone (Like Me) – Dolphins Lullaby – Sweet Bird.

The tracks on side two are almost in narrative style but all have excellent backing from the ten or so musicians listed on the cover. Unfortunately it is so printed that only somebody with 20/20 vision could read the fine print in violet on a slightly darker violet background. Herb Alpert's musical hand is evident in the skilful production; quality is excellent. (N.J.M.)

★ ★ ★

JOHN DENVER . . .

"very professional"

JOHN DENVER'S GREATEST HITS VOLUME II. John Denver. RCA Victor CPL1-2195.

This is a very professional album from John Denver. It appears to have been specially recorded, and is not simply a collection of earlier recordings. Olivia Newton-John lends a helping hand on one of the tracks, while John plays 6 and 12-string guitars, as well as supplying all the lead vocals.

In order, the tracks are: Annie's Song – Welcome To My Morning – Fly Away – Like A Sad Song – Looking For Space – Thank God I'm A Country Boy – Grandma's Feather Bed – Back Home Again – I'm Sorry – My Sweet Lady – Calypso – This Old Guitar.

Musically, this record is very pleasant, and I would thoroughly recommend it on those grounds. However, technically it was a little disappointing, as there was very noticeable distortion on the last track. In addition, some sibilance could be detected at various points throughout the album. (D.W.E.).

New Products

Multi-band portable with DF facility

The Dick Smith F-1000 is a portable multi-band receiver with a difference. The difference is that it is equipped with a calibrated rotatable ferrite rod aerial assembly, which makes it capable of being used for radio direction finding on the medium wave broadcast band, as well as on the low frequency band which includes a number of radio beacons for aircraft navigation. The receiver also tunes the VHF aircraft bands.

At a casual glance, the F-1000 receiver looks pretty much the same as a number of others which are currently available, except for the rotatable aerial assembly and calibrated dial atop the case. The unit is housed in a black moulded plastic case measuring 260mm wide x 205mm high (not including carrying handle) x 85mm deep. The picture gives a good idea of the neat appearance. It is made in Japan for Dick Smith Electronics by Fuji Onkyo Co. Ltd.

Basically, the receiver is a solid state five band superheterodyne. Frequency ranges are: broadcast band 530kHz-1600kHz, FM band 88MHz-108MHz 27MHz band 26.8-27.8MHz, long wave band 150kHz-400kHz, and a VHF band from 108MHz-174MHz. From these figures it may be seen that the receiver is very versatile. The only omission is any coverage of the conventional "short wave" part of the spectrum, and this seems reasonable enough when one considers all the other facilities offered.

To achieve the rather wide frequency coverage, the designers have used no less than three front ends. By doing this, there should be less compromising than if a common front end stage were made to function over the wide frequency range. Also, as may be expected, two intermediate frequencies are used, 10.7MHz and 455kHz where appropriate. Separate detectors are also provided for AM and FM reception. The loudspeaker is nominally 3in x 5in and audio output is rated at 330mW, which is sufficient for portable use.

The receiver is intended for operation from a 6V supply of four C size dry cells. No provision is made for direct mains operation but this may be achieved indirectly from a separate 6V external supply introduced via a socket for the purpose.

The most important feature is undoubtedly the direction finding facility. This feature may be used on both the broadcast band and the long wave band and I found that it gave bearings in a very satisfactory manner. Full details on how to use the receiver for direction finding are included in the instruction manual.

Given this direction finding facility, provided one has a list of broadcast and low frequency stations, it is only necessary to identify one or more appropriate stations and take bearings. It then becomes possible to navigate safely in the outback wide open spaces, or even at sea within range of usable signals. I would hasten to add, that in common with all such situations, it would be very unwise to rely solely on one piece of equipment where lives are at stake.

To facilitate taking radio bearings, a meter is provided, which doubles as a tuning meter on all bands except the FM and VHF bands. To take a bearing, a station is tuned in and then the DF-RADIO switch is set to DF and the DF LEVEL control is adjusted to give a suitable meter reading. The direction finding loop is then rotated for a minimum dip on the meter. Greater accuracy may be had by careful adjustment of the DF LEVEL control while determining the point of minimum dip. The calibrated dial under the loop may be used in conjuction with the compass to obtain the required bearings.

The "sights" provided on the loop assembly make it possible to take a bearing on any known fixed object, rather than making use of the radio DF facility.

Taking into consideration that the receiver is a small portable, the performance on all bands is very good. However, as may be expected, on the VHF band, tuning is rather sharp and calls for some care in tuning in signals properly. Also, on the FM band, tuning seems to me to be somewhat indefinite. However, having tuned a wanted station and despite some doubt as to the precise position, pressing the AFC button brings the station properly in tune and the AFC keeps it that way.

Both the scale and the DF aerial loopstick are rotatable independently. On the unit under review, there was a certain amount of "play" of the calibrated scale when the DF loopstick was rotated. The play amounted to about 5° or so and this could introduce some error in readings unless measures were taken to correct it.

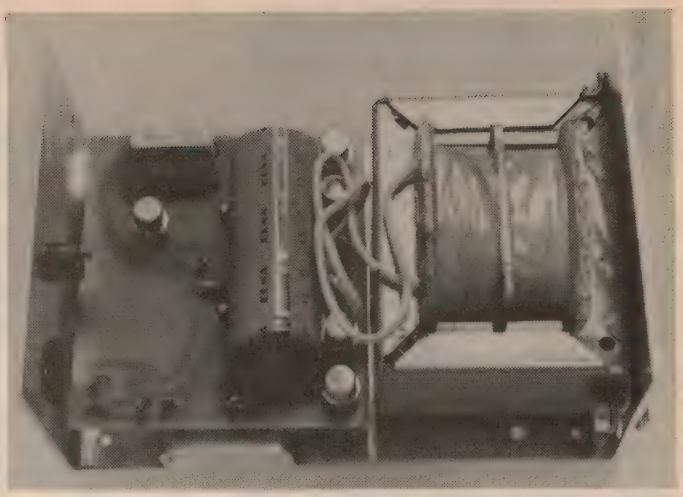
The loopstick direction finding aerial is used on both the LF and AM broadcast bands while for the other three bands, a telescopic rod aerial is provided. When extended, it is possible, by means of a hinge at the base, to rotate the aerial in any desired direction in order to obtain best reception of the wanted station.

If you have use for a radio direction finder and combined portable receiver offering the extra band coverage, then the F-1000 should meet that need. It is imported by and available from Dick Smith Electronics, 162 Pacific Highway, Gore Hill, N.S.W. and other branches. (I.L.P.)

As well as the direction-finding facility, the F-1000 receiver offers FM reception, CB and VHF reception in the 108-174 MHz band.

CB supplies from Statronics

Three new modular power supplies designed to operate CB transceivers and similar equipment have been added to the range produced by Statronics Pty Ltd.



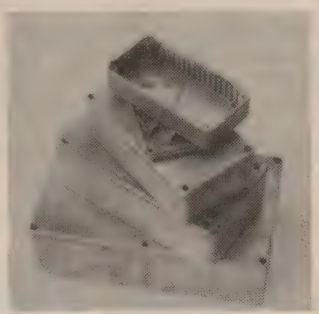
The new supplies are a continuation of the modular concept used in the STA53 supplies reviewed in the April issue. They are identical to the existing models in external dimensions. The three models are rated at 12V/3A, 13.8V/3A and 13.8V/5A, the last being suitable for powering relatively high power equipment.

Output voltage is rated to be within 10% of the nominal value, with 1% line regulation, 2% load regulation and ripple and noise below 0.5mV per volt at rated load. The sample 13.8V/3A unit tested was well within these figures, with load regulation at around 0.3% and ripple and noise less than 5mV peak to peak at 3A. In performance it is thus an excellent substitute for an accumulator, and one which should be suitable for operating equipment like PA amplifiers where supply ripple can be embarrassing.

All three supplies are fitted with a LED indicator, which extinguishes if the supply is overloaded. On the sample unit tested, the LED was inside the case, but we understand that later supplies have the LED mounted in the end of the case so that it is more readily viewed. Each supply is available in either the open version pictured, or in a bench version with perforated cover. Later units will have an improved mains cord anchor and terminal block, to meet mains authority safety specifications.

In cost the supplies range from $38.50 plus tax for the 12V/3A model to $42.50 plus tax for the 13.8V/5A model, with the bench versions about $4 extra. Enquiries to Statronics Pty Ltd, 103 Hunter Street, Hornsby, NSW 2077.

New range of diecast boxes



Dick Smith Electronics has announced the availability of the new range of diecast aluminium boxes shown in their latest 77/78 catalog. Imported, the new boxes are precision diecastings which feature channelled inside walls for very adaptable PCB mounting. When assembled the boxes are fully screened to RF, and will stand heat up to 1000 deg F.

Four sizes are available, measuring 100x25x50mm (H-2221), 120x40x65mm (H-2211), 150x50x80mm (H-2206) and 190x60x110mm (H-2201). Prices range from $3.00 for the smallest to $7.50 for the largest, with discounts for quantity. Very suitable for prototypes and special projects, the new boxes are available from all Dick Smith stores and dealers.

Logic probe checks both TTL & CMOS, catches pulses

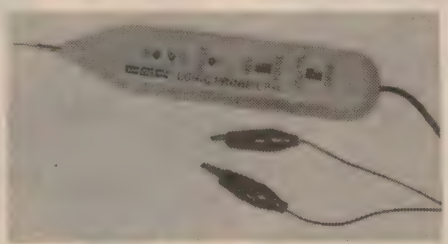
The CSC LP-1 Logic Probe is a small handheld unit using LED indicators. It detects, stores and displays logic levels, pulses and voltage transients in DTL, TTL and CMOS logic circuits.

The unit measures 147 x 25.4 x 17.8mm, and is fitted with a probe at one end, and a 610mm long colour coded set of power supply clip leads at the other. Two small slide switches and three LED indicators are mounted along the centre line of the probe body.

In use, the supply leads are connected to the supply lines of the logic to be tested. The unit is protected against both over voltage and reverse voltage. The required logic family is then selected by the appropriate switch, and the probe tip placed in contact with the node to be tested.

In the DTL/TTL mode, the HI LED emits when the input exceeds 2.25V, while the LO LED emits when the input voltage is less than 0.80V. These levels compare closely with the guaranteed minimum and maximum TTL levels of 2.4V and 0.8V.

In the CMOS mode, the logic 1 (HI) threshold is set at 70% of the supply voltage, while the logic 0 (LO) threshold is set at 30% of the supply voltage. Once again, these levels compare closely with CMOS thresholds. In the CMOS mode,



the probe can also be used with HTL systems using a 15V supply.

The input impedance of the probe is 100k, and the maximum allowable input frequency is 10MHz. A bipolar edge detector is provided, which is capable of "catching" pulses (either negative or positive going) with durations down to 50nS. The output from the edge detector is passed to a monostable with an output pulse width of ⅓ second. This drives the pulse LED.

By switching to the memory mode, single pulses with widths as low as 50nS can be caught and stored. Some care is required in using this mode, as the probe tip must be placed in contact with the test node before switching to the memory mode. This is to prevent any contact transients from triggering the memory latch.

In use, we found the LP-1 to be a versatile, well designed tool. The function of the indicator LEDs is easy to comprehend, and the indications they give are unambiguous. The instructions supplied with the unit are very clear, and we found them easy to follow.

The LP-1 Logic Probe is distributed in Australia by General Electronic Services, of 99 Alexander Street, Crows Nest NSW. Recommended price of the unit is $52.00, plus 15% sales tax if applicable. (D.W.E.).

NEW PRODUCTS

Effective, new swimming pool alarm

This new alarm system should be of great interest to those readers who have backyard swimming pools. Designated the Pool Monitor, it is designed to provide an effective system that will warn of accidental or unauthorised use of a swimming pool—while at the same time virtually eliminating false alarm conditions.

There have been quite a few designs for swimming pool alarms over the years, but there are now only a few left on the market. Most suffered from a high incidence of false alarms due to water action caused by wind or rain, and none would work with an automatic pool sweep.

The Pool Monitor, manufactured by Stevens Associates, California, is designed to overcome these problems. The principle of operation employed differs quite significantly from previous designs in that it uses a capacitance plate to detect changes in wave action within the ½ to 2Hz frequency range.

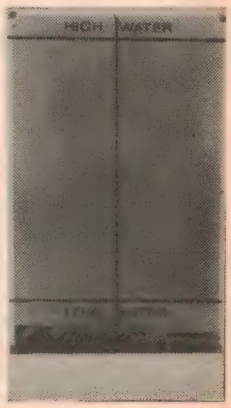
To explain, tests indicate that it is frequencies within this range that are generated when an object weighing 10kg or more (i.e., a human body) falls into or undergoes movement in a swimming pool. Wind and rain on the other hand establish wave ripple frequencies greater than 4Hz, and are rejected as noise by the associated electronic circuitry.

As a further precaution against false alarm due to noise, the sensor plate must sense 3 continuous wave ripples before the alarm will activate. Once triggered, the alarm will sound for about 5 minutes (unless stopped) and will then automatically reset.

The accompanying photograph shows the basic elements of the Pool Monitor. They are the sensor plate, a "mini-console" which houses most of the circuitry and the loudspeaker, and a 12V AC/DC adaptor. The flat sensor plate measures approximately 15 x 30cm, and is designed to attach to the side of the pool at the water line. Twin lead hook-up wire connects to the sensor plate to the mini-console.

Above is the "Mini-Console", which houses most of the circuitry.

At right: the pool sensor panel.



Layout on the front panel of the mini-console is simple, with a single on/off/test switch, two earphone jacks, and a LED indicator. One earphone jack is for power input, while the other accepts the line from the sensor plate. ▶

A good safety feature of the device is that the alarm will sound if the line to the sensor plate is accidentally disconnected or broken.

According to the manufacturer, the Pool Monitor can cover 500 square feet of pool area using a single sensor plate. The average 30 x 15ft pool has an area of 450 square feet. Additional sensor units can be added for larger pool areas.

At a recent Sydney demonstration, the Pool Monitor proved an effective, reliable unit. It triggered reliably whenever heavy objects (greater than 10kg) were thrown into the pool, and was virtually free of false alarm conditions. In fact, there was only one false alarm during the entire 2 hour demonstration, despite adverse wind conditions.

Recommended retail price of the Stevens Pool Monitor is $240.00. Readers should direct their enquiries to Electronic Concepts Pty Ltd, 52-58 Clarence St, Sydney NSW 2000. Telephone 29 3753.

PC mounting power transformers

Ferguson Transformers is now marketing a range of general purpose 5VA transformers enclosed in a plastic case for PC mounting. Case dimensions are a compact 55x42x34mm (LxWxH).

Designated types PL/5VA, these transformers come with output voltages ranging from 3-30V. Plastic mounting lugs on the case ensure positive PC board mounting. The plastic case may be left off if space is a problem.

Enquiries to Ferguson Transformers Pty Ltd, 331 High St, Chatswood, NSW 2067.

New look for Eveready

This "new-look" Eveready battery range is now being marketed by Union Carbide Pty Ltd. The new look reflects the continuous product improvements made over the last few years, and carries right throughout the Eveready range. Included are the Eveready size AA, C and D 1.5V cells and the 9V 216 cells.

The Eveready battery range is available through a wide range of retail outlets. Trade inquiries to Union Carbide Pty Ltd, 157 Liverpool Street, Sydney, NSW.

100MHz dual-trace CRO

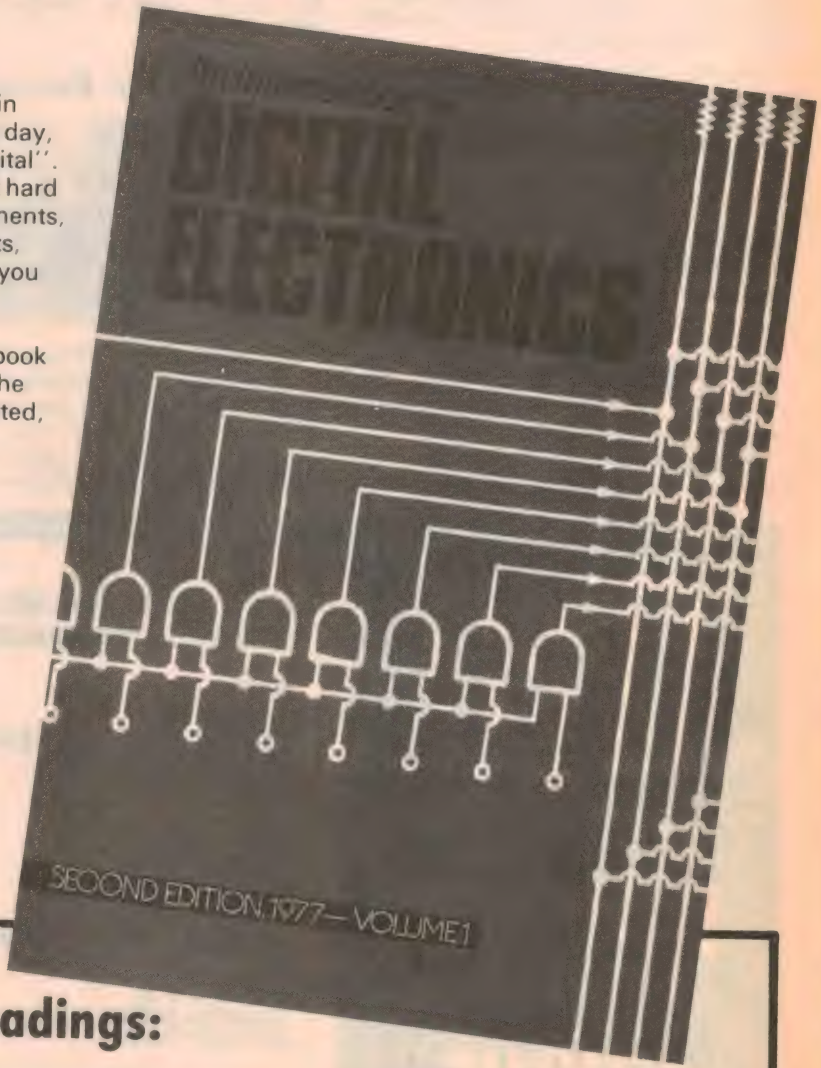
Comprehensive facilities mark the BWD 540 100MHz dual-trace oscilloscope. Abbreviated specifications are as follows: DC to 100MHz bandwidth; 5mV-20V/div attenuation range; x5 gain channel 1, DC to 30MHz –3dB; 5ns-5s/div main time base; 5ns-1s/div delayed time base; DC–100MHz main and delayed time base trigger; variable trigger hold off.

Further information from BWD Electronics Pty Ltd, Miles St, Mulgrave, Vic 3170.

Electronics is going digital. This book can help YOU go right along with it:

Electronic equipment now plays an important role in almost every field of human endeavour. And every day, more and more electronic equipment is ''going digital''. Even professional engineers and technicians find it hard to keep pace. In order to understand new developments, you need a good grounding in basic digital concepts, and An Introduction to Digital Electronics can give you that grounding. Tens of thousands of people—engineers, technicians, students and hobbyists—have used the first two editions of this book to find out what the digital revolution is all about. The new third edition has been fully rewritten and updated, to make it of even greater value. The author is Jamieson Rowe, Editor of ''Electronics Australia'' magazine, a qualified engineer and experienced technical writer.

You don't need any previous knowledge of digital electronics—the book starts you right from scratch, and covers all of the basic concepts you need.



PRICE $3.00

Available from newsagents, bookstores, electronic suppliers and also from ''Electronics Australia'', Box 163, P.O. Beaconsfield 2014. (Post and packing 60c).

Here are the chapter headings:

1. Signals, circuits and logic
2. Basic logic elements
3. Logic circuit ''families''
4. Logic convention and laws
5. Logic design: theory
6. Logic design: practice
7. Numbers, data & codes
8. The flipflop family
9. Flipflops in registers
10. Flipflops in counters
11. Encoding and decoding
12. Basic readout devices
13. Multiplexing
14. Binary arithmetic
15. Arithmetic circuits
16. Timing & control

Glossary of terms

Letters to the editor

Leaving industry

Within the next week I shall be leaving the ranks of those working within the electronics industry, and it is the sense of frustration surrounding my decision to leave which has prompted this letter.

After nearly ten years working both in private industry and for the Public Service, I find many of the glib predictions of earlier years regarding employment opportunities, sounding rather hollow at best.

Without becoming involved in a discussion regarding any political decisions which have affected the Australian electronics industry, I am appalled at the industry's general lack of acceptance of the value of the skills it demands from its employees. Consistently throughout my experience it was common for a company to place more recognition and status upon their delivery drivers than it did on their technical personnel; a recognition which was reflected in company salary rates. This under-estimation of the value of one's electronic skills and experience perhaps could partly be blamed on the lack of any definite industrial action over the intervening years, indeed, on the lack of a really coherent organisation designed to reflect the wishes of all sections of the industry, and not those of certain sections alone.

In my own field I have been concerned with the maintenance and upkeep of communication systems from SHF to HF; a field which has required considerable study and effort to gain the necessary tertiary qualification. And for all this effort and devotion to duty, I find that bank clerks and plumbers, etc., can earn in excess of my salary; in short I feel cheated in that the relativities between the various professions and trades have been completely destroyed, less-skilled and unskilled personnel being able to command more return from society.

I should like to be able to convince myself that money should be a secondary consideration in a field where work satisfaction is its own reward, but years of city living and indifferent treatment from largely ungrateful customers has left me more than a little scarred and cynical.

In the same breath I find the Government's attempts to import skilled migrant labour little more than a foolish exercise in shortsighted political expediency, especially when what skilled labour there is remaining, goes ignored and unrewarded. For years we in the electronics service industries have been selling our skills far too cheaply. My own answer is to become a cabbie; at least I can fix my own radio!

N. Hughes
Airport West,
Melbourne, Vic.

Microprocessors

I have followed with interest, the interchange between EA and Mr. Karl Reed (December 1976, May 1977) on the subject of microprocessors, the "priestly caste" of programmers, "mere engineers", and the attitudes of one to the other. My own background is 12 years as a programmer, and three months as a micro-owning hobbyist.

My feeling is that not only is there room in the microprocessor world for both programmers and engineers, but it is necessary for the two to get together in order to realize the full potential of the microprocessor, whatever it may be. This marriage of disciplines has not happened so far for a number of reasons.

I am unconvinced that the professional programmer views the microprocessor with an "attitude of aloof condescension". He probably hardly realizes that they exist. Most of the literature on microprocessors is either in hobbyist magazines like Byte, or in electronics magazines like EA, neither of which are likely to be read by the average programmer. The microprocessor simply hasn't penetrated into the world of the programmer (with the exception of Dr. Len Whitehouse's recent riotous lecture to the Australian Computer Society).

Those programmers who are aware of the existence of microcomputers probably regard them as I did—as a chip which can only be used if one belongs to the incomprehensible world of electronics, smelling of solder and wielding a 30 watt temperature controlled magic wand! It looks like a piece of the hardware world, not an area crying out for programming.

On the other hand, I feel considerable sympathy for the engineer faced with an empty computer, no software and, initially perhaps, little idea of what is required or how to program it. The development tools required, some of which Karl indicated in his May 1977 letter, can most easily be provided by programmers, who've been through it all before. It would be a crying shame to force micros through the period of "failures and misconceptions" through which we put mainframes, and more recently, minicomputers.

There are two rays of hope, I feel. One is the formation of microcomputer enthusiast clubs and groups (populated predominantly by engineers, and a few programmers). The other is the recent announcement of the intention to form a special interest group on microprocessors within the Australian Computer Society, members of the Society being predominantly programmers. Maybe the two castes can finally get together?

R. Edgecombe, Secretary
Micro Computer Club of Melbourne
Canterbury, Victoria

COMMENT: Let's hope so, anyway!

Calculator offer

With reference to your project on the Heathkit ICL-2009 Calculator Kit in the March 19-7 issue, I wish to state that I ordered one and received a reply from Warburton Franki Industries, 220 Park St, South Melbourne. I was informed that although they had "several hundred" when you reviewed the kit, they have now sold out and are unable to obtain further supplies.

I can only come to the one conclusion on the whole project, and that is that you and all your clients of Electronics Australia were conned. There never was such a calculator kit available at that price. I imported an electronic watch kit from England for $22, but it cost me over $11 in duty and postage. To sell the calculator kit at say $12, it would have to be bought overseas at less than say $4, allowing for freight handling charges, etc. I won't look at Warburton Franki or Heathkit ads in future.

T. Condon
Numurkah, Victoria.

COMMENT: Your disappointment in missing out is understandable, but before writing such an insulting letter it might have been a good idea to check your facts. In the March article, the second-last paragraph (p.79) says "But if you want a kit, be early. At that low price current stocks won't last long, and any future shipments could well cost a lot more." Also although your letter is dated April 13th you apparently didn't bother to read the note we published on page 3 of the April issue. This explained that although Warburton Franki had what seemed an ample stock of 600 kits, these went in three days after the issue was published.

Books & Literature

What do hams do?

HAM RADIO—A Practical Guide and Handbook, by Kenneth Ullyett. David & Charles Ltd, London, 1976. Hard covers, 143 x 223 mm, 163pp., with illustrations. Price in Australia $11.50.

An introduction to amateur radio, but one with a difference. It is written for those with no previous knowledge of the subject, seeking to give such readers a broad overview of all the varied activities encompassed by the hobby. There are no circuits, wiring diagrams or maths, and the only technical data given are some useful definitions and other information in an appendix at the rear.

The author is an experienced technical writer and editor, and has been able to strike a very good balance between the human, social and technical aspects of amateur radio. There is enough technical detail and atmosphere to interest those with a potential interest in the hobby, yet not so much that such folk could be scared off.

In short, a book which "soft sells" amateur radio, without self-conscious flag waving. It makes interesting reading, and should be an ideal choice for anyone presently wondering just what amateur radio is all about—without necessarily wishing to dive in at the deep end.

The review copy came from the Australian distributor, ANZ Book Co Pty Ltd. (J.R.)

Hifi speakers

BUILDING HI-FI SPEAKER SYSTEMS by M. D. Hull, C.Eng., AMIERE (Sixth edition). Published 1977 by the Electronics Components and Materials Division of Philips. Stiff paper covers, 232pp 210mm x 148mm, illustrated by diagrams and pictures. Price in Australia not quoted.

One does not need a second glance to recognise this as a publication of Philips, Eindhoven, partly from its style and partly because it is the sixth edition of a title that has been around since late 1969—surely a tribute to its acceptance.

First let me list the chapter headings: Sound Reproduction — Moving Coil Loudspeakers — Loudspeaker Enclosures — Multi-way Speaker Systems — Listening Room Acoustics — Step-by-Step Construction of a 7-litre Enclosure — Constructional Details for 17 Tested Speaker Systems — Building a 3-Way Speaker System (pictorial) — Technical Data.

The text is written at such a level that it could be read with considerable interest by hifi enthusiasists wanting to know why things are so. Statements are made and duly supported by specific data and graphs.

Whether an enthusiast could use the data to design his own system is another matter, however, because correlation of the formulas with the parameters of drivers would tend to be an engineering level exercise appropriate for graduates and sub-graduates rather than hobbyists. At this level, sub-graduates should also find the book useful.

But, for the handyman, resort would have to be to the final 100-odd pages, which cover the construction of topical systems, all using Philips drivers. They are similar in concept to what have been promoted by Philips Elcoma in Australia, but appear to differ in detail. One word of warning: crossover inductor values are given but no winding or design information; hopefully, there would be local sources of supply.

So there you have it: a book which reflects the Philips Components approach to loudspeaker system design at three distinct levels: enthusiast, student/engineer, and handyman/cabinetmaker. Our copy came from Dick Smith Electronics. (W.N.W.)

Digital primer

AN INTRODUCTION TO DIGITAL LOGIC, by A. Potton. Macmillan Press Ltd, London, 1973. Soft covers, 155 x 234 mm, 144pp., many diagrams. Price in Australia $3.95.

As its title suggests, this is a basic introduction to logic theory and circuit operation. The author is Principal Lecturer in Electronic and Electrical Engineering at the City of Leicester Polytechnic, in Britain, and writes in his preface that it is intended for students in engineering and technician courses.

The chapter headings give a good idea of the topics covered: 1—Combinational Logic Circuits; 2—Boolean Algebra; 3—Design of Simple Logic Systems; 4—Karnaugh Maps; 5—Bistable Systems; 6—Counters and Registers; 7—Synchronous Counters; 8—Simple Sequential Logic Systems; 9—Binary Arithmetic Operations; 10—Practical Considerations.

The last of the chapters deals with such matters as loading, noise margin, propagation delay and logic families—including ECL and CMOS.

The treatment is reasonably up to date, although its 1973 origin is revealed by the degree of emphasis on such matters as Karnaugh maps, minimalisation and discrete circuits—now of little more than historical interest in this age of microprocessors.

Still, the topics the book does deal with are presented clearly and concisely, so that it would make a good reference for anyone with no previous knowledge of digital concepts.

The review copy came from Macmillan Australia, but the book should be available at all major bookstores. (J.R.)

. . . and another

DIGITAL ELECTRONIC CIRCUITS AND SYSTEMS, by Noel M. Morris. Macmillan Press, London, 1974. Soft covers, 155 x 233 mm, 143pp, many diagrams. Price in Australia, $5.95.

Another basic introduction to digital electronics, and like the book reviewed above, the author is a Principal Lecturer at a British polytechnic—this time at North Staffordshire. In this case the book forms part of the Macmillan Basis Books in Electronics, a series written for both students and mature readers wishing to update their knowledge.

The scope covered is a little wider than the book by Potton, but is otherwise

rather similar. The chapter headings read 1–What is Logic?; 2–Basic Logic Functions; 3–NAND and NOR Functions; 4–Electronic Switches; 5–Electronic Logic Circuits; 6–The Algebra of Logic; 7–Logic Networks; 8–Memory Circuits; 9–Arithmetic Processes; 10–Asynchronous Counters; 11–Sychronous Counters; 12–Shift Registers and Ring Counters; 13 – Applications of Digital Electronics.

The text is clear and concise. It is little more practical in orientation than the Potton work, but like the latter is now slightly dated in view of the impact of microprocessors. However, as a basic introduction to digital concepts it too should be found quite worthwhile and good value for the modest outlay involved.

The review copy came from Macmillan Australia, but the book should be available at all major bookstores. (J.R.)

Radio fundamentals

A COURSE IN RADIO FUNDAMENTALS, fifth edition, by George Grammer. Published by the American Radio Relay League, Inc., Newington, Connecticut. Soft covers, 167 x 242 mm, 184pp., many illustrations.

This latest edition of A Course In Radio Fundamentals was originally reviewed in August, 1973. A second copy has now been received. To recapitulate briefly, this is a book which is very well written at a level which should suit students and amateurs alike. There are 26 chapters, which start with electrical fundamentals and progress through device theory, etc. Each chapter concludes with tutorial problems, the answers to which are given at the end of the book along with suggested experiments and a data appendix.

Antenna "bible"

THE ARRL ANTENNA BOOK, published by the American Radio Relay League, Inc., Newington, Connecticut. Third printing of the 13th Edition, 1976. Soft covers, 165 x 242 mm, 336pp., many photographs and diagrams.

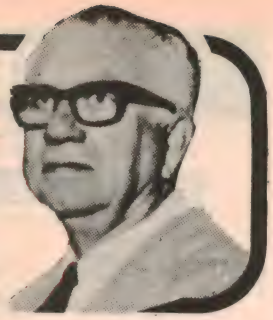
A review copy of this third reprinting of the 13th edition of the ARRL antenna "bible". As the book appears to be substantially unchanged, we would refer readers to our earlier review in the October 1974 issue.

Power supplies

NS Electronics has advised us that its well-known Voltage Regulator Handbook is now available again in Australia, from NS distributors and suppliers. As well as being a data book on National's voltage regulator ICs, the handbook is also a very informative guide to power supply design and the use of both fixed and variable three-terminal regulators. It is good value at around $3.50 retail.

The Amateur Bands

by Pierce Healy, VK2APQ



Amateur Satellites—OSCAR Phase III

Communication satellites may not now warrant a second thought by the community in general, but to the amateur they have opened up new fields for experiments and community service. AMSAT Phase III will extend those parameters.

It is more than 15 years since the first amateur satellite OSCAR I was launched; the world's first non-governmental satellite. The six OSCAR satellites that have followed have demonstrated that amateurs can successfully design, construct, and control such complex devices. In addition, amateur satellites have proved their worth, not only as a communication tool but also as a useful experimental and educational unit available to anyone wishing to use them.

At present two satellites, OSCAR VI and OSCAR VII, are in orbit around the earth. The former, due to battery deterioration is nearing the end of its operational life, after more than 22,000 orbits since its launch on October 12th, 1972. The latter, a bigger and better version of OSCAR VI, launched on November 15th, 1974, is providing excellent service after about 12,600 orbits. It is an example of amateur co-operation on an international scale. Amateurs from Germany, Australia, Canada and the USA contributed to the design, construction and control.

The first five (Phase 1) OSCAR's demonstrated that spacecraft could become useful and popular means for worldwide communication between amateurs.

OSCAR VI, the first long-life, solar-powered amateur satellite, marked the start of Phase II which continued with OSCAR VII.

The major shortcoming of the Phase II satellites is their limited availability (less than two hours a day for most amateurs) and relatively short communication coverage area. To overcome such problems special attention is being given to the type of orbit Phase III satellites should be given.

A factor to be considered is that more than 90% of the amateur population is in the northern hemisphere. One orbit being considered has a period of eleven hours, an inclination of 63.4 degrees and an apogee as far north as possible. This would enable most northern hemisphere stations to see the spacecraft (radio wise) for 14 to 16 hours a day and those in the southern hemisphere, above 45 degrees south, six to seven hours a day. (All of Australia and most of New Zealand is above 45 degrees.)

To acquaint amateurs generally with the current activities and details of Phase III a three part article commenced in the June, 1977 issue of "QST". This was preceded by the following extract from the AMSAT newsletter of March, 1977.

"An exciting new phase in amateur radio is about to begin, one that will affect all amateurs. OSCAR satellites of the new AMSAT Phase III series will soon revolutionise long-distance amateur communications in the same manner that earth-bound repeaters have completely transformed local communications—by dramatically increasing communication reliability while simultaneously reducing the cost and complexity of individual amateur stations. The first Phase III spacecraft, now scheduled for launch in 1979, will be available to most amateur stations 17 hours each day, and will make communications possible between stations separated by up to 17700km.

"Amateurs interested in DX, rag chewing, contests and traffic handling will find Phase III satellites as easy to use as the whimsical ionosphere and their favourite band. AMSAT Phase III spacecraft are being designed so that output powers of the order of 50 watts (CW or SSB) at 145 or 435MHz and a small antenna resembling a TV antenna will usually outperform a high frequency band kilowatt and tower mounted beam. In effect, each satellite in the Phase III series will provide a new band with capabilities for worldwide contacts, usable by hundreds of amateurs at a time.

"But AMSAT needs your help to make Phase III a success. Hardware costs for the Phase III spacecraft are estimated at $200,000. A government or commercial satellite providing similar performance would cost about $10,000,000. While the figure of $200,000 may sound very large, once the system is operational the cost per user will actually be less than many United States amateurs are current contributing to local repeater groups. In addition, individual users will find that their home station investment will be significantly decreased. With the rapid growth in amateur radio the question really is; Can we afford not to go ahead with the Phase III program?

"What can you do to help:

1. Join AMSAT as a member for $10 per year in support of the amateur satellite program, or become a life member for $100.

2. Volunteer your services for engineering design, construction, fund-raising and other Phase III activities.

3. Sponsor a piece of the action by sponsoring part of the Phase III satellite. Sponsor one or more solar cells ($10 each), battery cell ($200), solar panel ($2000), transponder ($5000), onboard microcomputer ($8000), or apogee motor ($10,000). Sponsors will receive a certificate suitable for framing, acknowledging their specific contribution. Contributors of $1000 or more will have their names inscribed on a plaque included in the spacecraft orbiting the earth.

"Send your contribution and membership dues to AMSAT, PO Box 27, Washington, D.C. 20044, USA."

There are AMSAT affiliate organisations in: Mexico, Japan, Australia, Nederlands, Germany, United Kingdom, Italy and Canada.

In addition there are AMSAT co-ordinators in: Costa Rica, Peru, Brazil, India, Switzerland, New Zealand, France, Ivory Coast, Seychelle Islands, Romania, Poland, Ireland, Greece, Philippines, South Africa, Israel, Chile, Iceland, Cyprus, USA and Canada.

Truly an international amateur organisation worthy of support.

Radio clubs and other organisations, as well as individual amateur operators, are cordially invited to submit news and notes of their activities for inclusion in these columns. Photographs will be published when of sufficient general interest, and where space permits. All material should be sent to Pierce Healy at 69 Taylor Street, Bankstown 2200.

WIRELESS INSTITUTE NEWS

The federal executive of the WIA reports that a revised syllabus for the novice class licence has been prepared by Roger Davis, VK4AAR, Rex Black, VK2YA, Keith Howard, VK2AKX, Ken Hargreaves, VK2AKH, Graeme Scott, VK3ZR and a number of interested amateurs, and forwarded to the Post and Telegraph Department R.F.M.D. for comment and ultimate official adoption. When the department has responded the accepted version will be published.

News from the International Amateur Radio Union headquarters reports that 23 member societies have received favourable response from their governments and 11 out of 30 societies expect to have amateurs appointed to government delegations to the World Administrative Radio Conference in 1979. The WIA has approached the Australian government in this regard and have nominated the WIA federal president, Dr David Wardlaw, VK3ADW as its representative.

Sending and maintaining a representative at such a conference is an expensive commitment. This was one aspect discussed at the recent federal convention. It was decided that the WIA ITU fund be supplemented by a per capita levy by the WIA divisions. Each division would then decide how best to raise the levy. This will begin in December, 1977.

Amateurs can help WARC 79 projects as follows:— Firstly, by retaining their WIA membership. Secondly, by assisting in every way possible to raise money for the vital ITU fund. Thirdly, by recruiting as many new members as possible for the WIA. And lastly by supporting the Institute in every possible way, including responsible behaviour on and off the air.

REMEMBRANCE DAY CONTEST

The annual RD contest, sponsored by the WIA to perpetuate the memory of Australian amateurs who paid the supreme sacrifice in World War II, will be held over the weekend 13th-14th August, 1977.

All Australian and New Zealand amateurs are invited to participate.

Rules for this year's event had not come to hand as these notes were being compiled. However, the general format is expected to be as in previous years and the contest will commence at 1800 hours EAST, preceded by a recorded address over WIA official stations.

INTRUDER WATCH

WIA intruder watch co-ordinator, Alf Chandler, VK3LC, welcomes reports from amateurs and shortwave listeners on the intrusion of commercial stations into amateur frequency bands.

An intruder is any non-amateur transmission in an amateur band that has been declared exclusive to the amateur service. In Australia these bands are:— 3.5MHz to 3.7MHz; 7.0MHz to 7.1MHz; 14.0MHz to 14.35MHz (except 14.25 to 14.35 allocated to fixed stations in the USSR); 21.0MHz to 21.45MHz and 28.0MHz to 29.7MHz.

Contact Alf through PO Box 150, Toorak, Vic.

WIRELESS INSTITUTE CIVIL EMERGENCY NET

From the South Australian Division WIA journal, June, 1977, are some interesting snippets on WICEN activity in that state. These were issued by WICEN co-ordinator Alan Raftery, VK5BW.

Twice during the summer WICEN was called to assist the Emergency Fire Services in the Tea Tree Gully area. Fortunately the fires were brought under control quickly and the net was not required.

The Willunga Emergency Fire Service requested the assistance of WICEN in a survey to compare the use of HF and VHF in the area. With few exceptions two metre FM was better. WICEN was also called upon to standby whilst that EFS HF base station was non-operational.

Assistance was also given to the Good Neighbour Council, with their Australia Day Fair held in Elder Park, Adelaide. The operation was reported to have gone very smoothly and much appreciated by the organisers. Both the Prime Minister, Mr Fraser, and the state premier Mr Dunstan saw WICEN in operation on this occasion, as did some 20,000 people who attended the Fair.

Early in May, 1977, WICEN was activated when a

cyclone alert occurred in Darwin. Brian Austin, VK5CA established a link on 14.1MHz with Doug Haig, VK8JD and maintained schedules every 45 minutes until the cyclone broke up without any major problems being caused.

This month the Community Aid Abroad will receive assistance in their annual Walk Against Want between Adelaide City and Marion Shopping Centre. Last year assistance was given to marshalls controlling the walkers and searching for lost children.

A warm welcome is extended to amateurs to join the WICEN group as operators and for others interested in providing a service to the community to assist in many and varied ways. Contact Alan Raftery, VK5BW telephone 382 6840 (AH); 225 5787 (Bus).

WATCH FOR VK8NER/P6

It is pleasing to report activities of old friends, especially when their work takes them to out-of-the-way places and establish a "first time" activity.

Eddie Roache, VK8NER, VK8ZER and ex-VK4ZEZ will be operating as VK8NER/P6 for Giles Weather Station, about 650km south-west of Alice Springs, 80km on the West Australian side of the Northern Territory border, until the end of 1977.

Eddie is the first holder of a novice licence and probably the first limited licensee to operate from that remote station.

He will be operating on 3569kHz and 3575kHz lower sideband, 21.195MHz and 27.125MHz upper sideband, and the six and two metre bands. His QSL card manager is VK8GG, Jabiru Street, Darwin NT 5790. IRC or stamp for direct QSL would be appreciated.

OVERSEAS NEWS

INDIA: Although India has the lowest ratio in the world of amateur radio operators on a population basis, it is noteworthy that the number of amateurs has increased from about 300 in 1970 to 850 at the end of 1976.

The drive to stimulate interest in amateur radio started with the First All India Amateur Radio Convention held in Bombay at the end of December, 1969, with the formation of the Federation of Amateur Radio Societies of India.

With the encouragement of various government departments, industralists in electronic undertakings, and educational bodies, the scheme is steadily growing. Clubs have been formed in schools, technical colleges and universities, the aim being 3000 such clubs.

IONOSPHERIC PREDICTION SERVICE

Two publications are available free from the IPS Office, Goulburn Street, Sydney.

1. "Recurrent Storms and their effects on HF Radio Communication."

This paper describes the solar origin of the storms, the physical processes occurring in the ionosphere which leads to changes in the MUF and the actual variations of the vertical incidence MUF observed over several years at Australian ionospheric stations.

2. "Ionospheric Storm Effects on Maximum Usable Frequencies on Circuits Around Australia."

This report presents the results of an analysis of the effects of ionospheric storms on the maximum usable frequency (MUF) for circuits around Australia.

IPS officers welcome any reports on unusual propagation phenomena or marked variations to predictions. These should be passed on during the time the event is being observed.

RADIO CLUB NEWS

SOUTH WEST ZONE CONVENTION: To be held at Griffith, on the first weekend in October, 1977. A wide range of events, including the 25th anniversary dinner, is being arranged.

Accommodation is expected to be scarce. However, the organising committee will arrange bookings if they receive details prior to 30th August, 1977. Send $10 deposit to the Secretary, South West Zone Convention, PO Box 854, Griffith, NSW 2680.

GOLD COAST RADIO CLUB: As from the May 1977 issue the monthly newsletter of the GCRC took on a new format. It will now be possible to reproduce high contrast photographs and circuit diagrams.

The April meeting of the club was extremely well attended, the attraction being the sale of amateur equipment.

Visitors to the Gold Coast are welcome to attend meetings which are held in the old Surfers Paradise State School, Laycock Street, Surfers Paradise, on the second Friday of each month commencing at 8.00pm.

CENTRAL COAST AMATEUR RADIO CLUB: The CCARC reminds all amateurs that the club awards an attractive certificate to amateurs who have contacted stations on the central coast of New South Wales. To qualify, it is necessary for amateurs living outside the central coast to contact the club station VK2AFY, plus four other central coast stations, and send copies of log entries to the Awards Manager, CCARC, PO Box 238, Gosford, NSW 2250.

After verification, the award will be issued. The central coast is defined as that area within the boundaries of the Gosford and the Wyong Shires.

The CCARC meets on the first and third Fridays of each month in the clubrooms Dandaloo Street, Kariong at 8.00pm. Visitors are welcome.

ST. GEORGE AMATEUR RADIO SOCIETY: Three nets are conducted by members of SGARS, each using the club call sign VK2LE.

Tuesday—high frequency net: 14.110MHz at 0930GMT.

Thursday—very high frequency net: channel 4 repeater at 1000GMT.

Sunday—novice net: 3555KHz at 8.00am EST.

You do not have to be a member to call in to these nets.

MOORABBIN & DISTRICT RADIO CLUB: At the general meeting to be held on Friday 19th August, 1977, Mr Alan Knipe, senior radio technical officer with the Department of Transport's Air Transport Group automatic message switching centre at Melbourne Airport, will be the guest lecturer.

He will give a talk and demonstration, regarding the 8080 mini-computer micro-processor systems, now famous and used world wide. He will also discuss his homebuilt 8080 mini-computer, video display unit, and unique magnetic tape unit. Some aspects of programming with the 8080 will be discussed.

Visitors are welcome. For details telephone Glen Percy, VK3ZQP on 547 2895.

ILLAWARRA AMATEUR RADIO SOCIETY: The VK2AMW moon bounce tests for May, 1977 were carried out on the 28th in pouring rain. The amount of water on the ground made it seem like a maritime mobile operaion, with Charlie Proctor, VK2ZEN, having a damp few hours attending the antenna dish.

First time contacts were made with K9AQP/1 with "M" and "O" reports being exchanged. Then with K3NSS, who uses a 26 metre dish. Signals were very good on their first transmissions at 11dB and more on peaks, allowing R5 S3 T9 reports to be exchanged. Later the signal dropped to about 6dB above the noise.

A half hour CQ period from VK2AMW then followed during which a call was received from W7GBI. "T" reports were exchanged but no contact

was made.

At this point VK2AMW needed only one contact—ironically from within Australia—to achieve a "worked all continents" on 432MHz.

There is no other Australian station operating E-M-E on 432MHz, and the regulations do not permit the antenna beam to be lowered below 10° above the horizon, so the problem was overcome by arranging a low-power scheduled contact with VK2AYF, about 13km away in Wollongong. Reflections from the antenna dish side lobes were used.

Tests from VK2AMW are co-ordinated by Lyle Patison, VK2ALU.

WESTLAKES RADIO CLUB: The club repeater is now complete and has been undergoing evaluation tests.

The unit is performing above specifications with the receiver being more sensitive than expected.

As these notes were being compiled the installations on the tower at the remote site were nearing completion.

As soon as a call sign is allocated by the Radio Branch, field testing will commence.

The WRC repeater will operate on channel 10, 147.7MHz in and 147.1MHz out. The power output will be about 10 watts.

The official WIA Youth Radio Scheme publication, "Zero Beat", is now under the editorship of Roy Hartkopf, VK3AOH. This publication, containing instructional and constructional articles for the beginner, plus notes on the activities of the YRS in various states, is published at the beginning of September, December, March and June. The annual subscription for the four issues is $1.80, and may be forwarded to:—The Editor, Zero Beat Publications, 34 Toolangi Road, Alphington, Vic. 3078.

YOUTH RADIO SCHEME

There were twenty-four clubs registered with the YRS in NSW as at April, 1977. There were:—

Blue Mountains Radio Club
Belmore Boys' High School
DX Group
YRS Private Study Group
Gosford Youth Radio Club
Springwood High School
St. Paul's College Bellambi
Swansea High School
Taree Novice Group
Camp Technology
Westlakes Radio Club
Avondale Adventist High School
Turramurra High School
Whalan High School
Richmond River High School
Cowra High School
Katoomba High School
Toronto High School
Killarney Heights Novice Radio Group
North Ryde Youth Radio Club
St. George YRS Training Annexe
University of NSW Amateur Radio Society
Marist Brothers High School Eastwood
Kiama High School

At present there are only eight South Australian clubs registered with the YRS. The state secretary, Mrs Maxine McEvoy, 3 Tyne Street, Kilburn, 5084 invites inquiries from anyone desirous of forming a club.

In each state, suitable aids in the form of notes on radio and electronic theory, questions and answers, and teaching aids are available at reasonable cost to students and class supervisors.

In NSW, information may be obtained from David Wilson, VK2ZCA, Whalan High School, Mimika Avenue, Whalan, 2770.

In Victoria, from Rev. Bro. Frank Whittom, 204 Churchill Avenue, Braybrook, Vic. 3019.

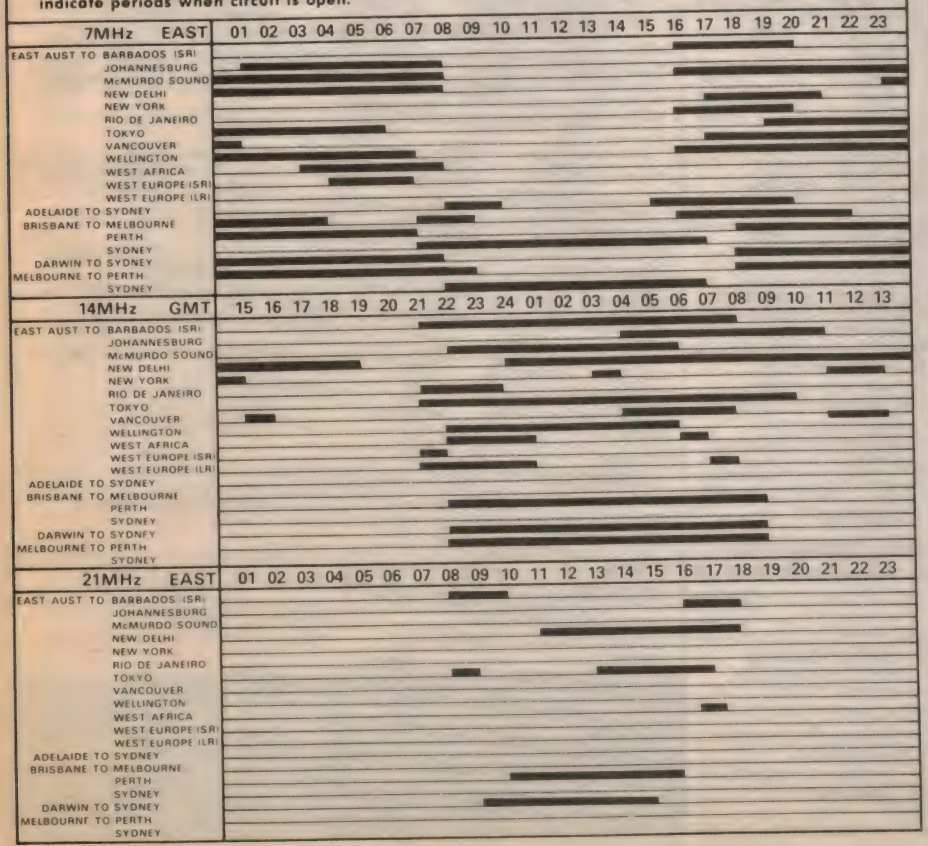
In Queensland, Roger Davis, VK4AAR, 2/32 Farrington Street, Alderley 4051.

In South Australia, Mrs Maxine McEvoy at address given above.

IONOSPHERIC PREDICTIONS FOR AUGUST

Reproduced below are radio propagation graphs based on information supplied by the Ionospheric Prediction Service Division of the Department of Science. The graphs are based on the limits set by the MUF (Maximum Usable Frequency) and the ALF (Absorption Limiting Frequency). Black bands indicate periods when circuit is open.

8.77



FREQUENCY METER AND CRYSTAL CALIBRATOR

TS-323/UR with spares Ex U.S. Navy. Bureau of Aeronautics brand new. 20 to 450 m/HZ. Accuracy of 0.01 per cent. Battery operated. Two a. batteries 6 volts three b. batteries 45V (135V) not supplied. AC power requirements 240 VAC to 150 volt stabilised DC and 6 3 volt AC. AC Power pack not included.

PRICE $90.

$2 Cartage to rail. Freight payable at nearest attended railway station.

P.M.G. TYPE TELEPHONES

Standard desk type with magneto bell calling device. Range 30 miles. Uses standard batteries at each phone. Any number can be connected together on single line.

$35.00

(2 TELEPHONE SETS)

$2 Cartage to Rail. Freight payable at nearest attended Railway Station.

FOUR CHANNEL VHF TRANSCEIVER

125 to 140 M/hz. 28 volt DC operated AM single crystal locks both TX and RX on same channel complete with generator.

$33.00

EX ABC MAGNETIC RECORDING TAPES ¼"

PROFESSIONAL QUALITY

5" x 600'	$1.50
7" x 1200'	$2.75
10½" x 2400'	$5.95

P&P A. $1.10, B. $2.00, C. $2.25 D. $2.25

ILFORD 17.5 mm SPROCKETED MAGNETIC TAPE

1000 ft reels brand new original packing **$4.00 ea.** quantity available

Post A $1.30, B $2.00 C $2.30, D $2.80

No. 62 TRANSCEIVER

With headphones, accessories etc

$60

TELEPHONE WIRE

1 mile twin (2 miles) genuine ex-Army Don 8 perfect condition $35 per drum $2.00 cartage to rail freight payable at destination.

PRISMATIC COMPASSES

Genuine ex-army Mk 3, liquid damped, as new $45.00 P & P A. $1.70, B $2.25, C $2.40, D. $2.65

MORSE KEY	MORSE KEY BUZZERS
$1.75	$4.25
Post 40c	Post 60c

KAISE MULTIMETERS

A compact and handy tester for workshop or lab where quick circuit checks are required

DC Volts 2.5 to 1.000V (20.000 OHMS per volt) AC Volts 10 to 1.000V (10,000 OHMS per volt) DC Current 50 UA 25 MA 250 MA. Resistance 40 K OHM, 4 MEG OHM Decibels minus 20 DB plus 62 DB complete with instructions only **$24.20** Ea. P.P. $1.05. Multimeter similar to above 30,000 OHMS per volt **$29.50** P.P. $1.05.

Only $17.25 ea Post $1.05

BENDIX PIONEER

Drift Sight
Type B3
$250.00

4 DIGIT RELAY COUNTERS

50 volt DC, suit slot car Lap counters, etc.

$1.25 each. P & P 60c

NIBBLING TOOL

Cuts sheet metal like a punch and die, trims, notches and cuts to any size or shape over 7/ 16inch.

ONLY **$12.50**

Post $1.10

NIFE CELLS

1.2 Volt, fully charged, 4in x 3in x 1in 4 AH.

$1.50 each. P & P 80c

5" CRO TUBE 5 BPI $5.50 each

Post A. $1.40, B. $2.25, C. $2.70, D. $3.45

HANDY SIGNAL INJECTOR

Produces an Audio Signal in rich harmonics. Ideal for Sig Tracing in A.F., I.F., and R.F. circuits. Powered by 4 Penlight Batteries with On Off Switch and indicator lamp. Size 1½" Diam. 5" Long. Only

$6.95 Post $1.10

POSTAGE KEY:

A: NSW.
B: Vic, Qld, SA.
C: NT, Tas.
D: WA.

VALVES

BRAND NEW

		6BM8	$1.80
		6GV8	$1.50
6SN7GT	95c	CV850	$1.50
5U4G	95c	1H6G	75c
EF50	75c	832	$5.00
5Y3	$2.25	6X4	$1.80
2 x 2	75c	VR65	75c

P & P 40c

ARTILLERY DIAL SIGHTS MK2

Can also be adapted as a Dumpy Level or as base for a telescope has full 360° 5½" diam. gunmetal rotating circle. Adjustable elevation and depression. Has top grade ¾" diam. object lens. F.L.10" with cross hairs, eyepiece, ½" right angle prism.—height 10"—weight 3½kgs. With leather carrying case. Original cost $300.

Our Special only **$27.50**

P&P A. $1.95, B. $4.25, C. $5.90, D. $5.90

ZOOM SPOTTING SCOPES

30 x 30
LENGTH 12½", HEIGHT 10"
WEIGHT 1¾ lb.
$27.50

45 x 40
LENGTH 16"
HEIGHT 10"
WEIGHT 2 lb.
$39.75

High grade coated lenses. Ideal for pistol and rifle ranges or general viewing. Zooms in from very low to high powers. Complete with tripods.

POST: A. $1.70, B. $2.25, C. $2.40, D. $2.65.

TELESCOPES

25 x 30 **$7.95**

P & P A. $1.70, B. $2.25 C. $2.40 D. $2.65

SPY TELESCOPES

8 x 17 mag size of a rifle cartridge extends to 8" Only **$5.95** each, post 60c

BINOCULARS

PRISMATIC Coated Lenses. Brand new. Complete with case.

		P&P	
8 x 30	$32.50	A	$1.65
7 x 50	$43.95	B	$2.75
10 x 50	$44.95	C	$3.20
12 x 50	$46.00	D	$3.20
20 x 50	$47.50		

SMALL CLIP-ON POCKET TELESCOPE

15X **$5.20** Post 60c

RECEIVER No. 210

2-16 M/cs **$65.**
Transmitter No. 11 suits 210 **$35.**
24 volt Power supply to suit above **$15.**
Or complete station with Headphones, Mic, Morse Key, Antenna **$110.**

SOLENOIDS

Plunger Type 24V 300MA. Suit electric camera control, miniature trains, radio, etc.

$2.50 P & P 20c

200 MA 24 volt, ⅛in push movement. **$2.50 P & P 20c.**

SELSYN MOTORS MAGSLIP

RECEIVERS 2" MK2 $5.50

TRANSMITTER 3" MK2 $15.00

Post Packing A. $1.75 B. $2.75 C. $2.75 D. $3.65

3000 TYPE RELAYS

P.M.G. 200Ohms — 1'500Ohm
Coils **$2.50** each P & P 60c

P.M.G. TYPE KEY SWITCHES. 75c P & P 20c

Cossor Double Beam Oscilloscope 1035. Tested. **$150.00**

CONDENSER LENS

1½" Diam 4½" F.L. 75c 2½" Diam 2" F.L. **$1.50** each. Or **$2.50** per pair P & P 40c

IMPELLER PUMPS

New gunmetal body, Stainless Steel Shaft. Neoprene Impeller. Up to 15ft. Lift, suitable for almost any type of liquid. Self priming. Ideal boat bilge pump, sullage drains, etc. Approx size 8" x 5"

⅜" **$25.95** ½" **$34.95** ¾" **$39.95**

P & P A. $1.90, B. $2.75, C. $3.20, D. $3.95

MEGGER Battery Operated

No cranking—in vinyl case. Ranges: Meg Ohm 0-1000 Megs. Centre 20 meg. Rated voltage 500 volts. Low ohm 0-1000 ohm OH 1 range 0-1 meg ohm on 1k range. AC voltage 0-250 volts. **$85.00**

Post A. $1.60, B. $2.50, C. $2.75, D. $2.75.

SPECIAL

NEW HAND DRILLS

German Ixion Double Pinion usually $13.25 Special Only **$4.95** each.

P&P A $1.70, B $2.25, C $2.40, D $2.65.

TURN AND SLIP INDICATORS

Useful for parachutists glider, aircraft pilots tractors for indicating angle of sway $100 value only **$17.50**

P&P A. $1.60, B. $2.20, C. $2.50, D. $2.50.

ELECTRONIC FREQUENCY COUNTER

Austronic type DFC 4 240V 50 cycle 0 100KHz **$150**

PANORAMIC ADAPTOR

E.M.I. type PRA-1 455 variable Kc
Course 440-520 Kc
Centre Freq 520-440 Kc
Fine Centre Freq 20-0-20
Filter band with 50, 100, 200 L.F.
200 H.F. Sweep band width 0-200

$75.00.

TRANSCEIVERS Ex Army

No C42 set. 36 to 60 MHz with 24V power supply, headphone, mic, leads etc **$65.00**

No C45 set 23 to 38 MHz with headphones, mic. 24V power supply etc. **$95.00**

$1.00 cartage to rail, freight payable at nearest railway station

Hartley double beam oscilloscope. Type 13A with probes
Working **$150.00**

200M FOCUSING MICROSCOPES

Battery & Mirror Illuminated
900X Magnification $23.95
1200X Magnification $35.00

P & P A $1.70; B $2.25; C $2.40; D $2.65

EX-ARMY TWO-WAY FM RADIOS

1.2 WATTS OUTPUT
SUPERHET
PRC9 AND 9A 27 to 39 M/HZ
PRC10 AND 10A 38 to 55 M/HZ
WITH HANDSET ANTENNA $25 EA

$2 Cartage to Rail. Freight payable at nearest attended Railway Station.

16MM SOUND PROJECTORS IN GOOD WORKING ORDER

240 volts operated. Complete with Speaker and Amplifier

CINEVOX $150.00
BELL & HOWELL $250.00
SIEMENS $375.00

$1 Cartage to Rail. Freight payable at nearest attended Railway Station

CB RADIOS

PMG Approved. Famous Pony Brand on 27 Meg.
7 transistor model **$55** per set of two (hand held).
11 transistor model 1watt (hand held) **$72 ea.**
5 watt 6 channel **$99 ea.**
Post A. $1.65, B. $2.75 C. $3.20. D. $3.20.

"KAISE"

Trans-Match Ham Tester SWR, RF Power, Modulation Percentage, Relative Field Strength. **$45.00** P&P A $1.65, B $2.75, C $3.20, D $3.20

"KAISE"

SK-100 Multimeter 100,000 ohms per volt, 12 Amps. AC or DC **$55**
P&P A $1.65, B $2.75, C $3.20, D $3.20

Deitch Bros.

70 OXFORD STREET, SYDNEY 2010

SORRY NO C.O.D

Shortwave Scene

by Arthur Cushen, MBE

The popularity of short-wave stations is generally difficult to assess. Broadcasters and listeners world-wide thus look forward to the tri-annual popularity poll conducted by the International Short-wave Club of London.

The 1977 results were released recently and show that Radio Nederland in Hilversum, Holland, continues to be the world's most popular short-wave station. Second place went to the BBC World Service, third place to the Voice of America, and fourth place to Deutsche Welle, the Voice of Germany. These placings are exactly the same as were polled in 1974, and in fact the first 10 stations are unchanged except for some minor differences in their positions down the ladder.

The remaining placings up to 10th position were Radio Australia 5, Radio Sweden 6, Radio Canada International 7, Radio South Africa 8, HCJB Voice of the Andes 9 and Swiss Broadcasting Corporation 10. It is noted that the stations in Eastern Europe or those which carry predominantly propaganda in their broadcasts showed little impact with listeners. Radio Moscow was in place 14 and Radio Peking 27, while Radio Havana Cuba was in 22nd place.

The short-wave service of Radio New Zealand which operates only to Australia and the South Pacific increased in popularity from 44 to 41 notwithstanding the fact that last year the short-wave service was closed down for five weeks. In all, 88 stations appear in the list which shows the wide range of interests of short-wave listeners. The votes cast total 30,184 from 72 countries.

This poll reflects to some degree the programming of the top four stations, which cover a wide variety of music, news and comments. Radio Nederland in particular, with "DX Jukebox", "His and Hers", and "The Happy Station", leads the way in popularity with listeners. It is also notable that the four leading stations have relay basis overseas, thus enabling them to provide the best reception world-wide.

SPAIN'S ENGLISH SERVICE

The Voice of Spain, broadcasting from Madrid, has two transmissions in English for listeners in the United Kingdom and Europe. The first broadcast is 2030-2130GMT and the program is repeated 2130-2230GMT. Three frequencies have been used with 9505kHz providing the best reception, while 11840kHz is heard best between 2200 and 2230GMT. The broadcast on 11840kHz is blocked by Radio Australia up to 2200GMT, while at 2230GMT, during the closing announcement, there is some interference from Lisbon, Portugal, which is opening a transmission to South America. A third frequency, 7155kHz, is being used on a test basis. The address is The Voice of Spain, English Broadcasts to Europe, Madrid 24, Spain.

BRAZILIA CLOSES

The rather sudden closure of Radio Nacional at Brazilia will be regretted by many listeners to this popular station, which was heard up to the middle of June on 1542kHz with English from 2100 to 2200GMT. According to the BBC Monitoring Service the closure is only temporary as stated by the Ministry of Communications. It was decided to use the external service's transmitter for broadcasts to the Amazon because that area "has become very vulnerable to foreign broadcasts in Portuguese".

BHUTAN MOVES

Listeners may recall the introduction of special programs prepared by the National Youth Association of Bhutan several months ago, following a request from the Australian Radio DX Club. The frequency chosen was 7040kHz, an outlet that had been used for a weekly service in English and local languages from 1230-1330GMT on Wednesdays. Due to unsatisfactory reception, the station has advised Robert Hanner in Melbourne that this Wednesday program is now being broadcast on 4690kHz in an attempt to reduce interference. The transmission on Sundays, from 0730-0930GMT, continues on 7040kHz reports "Australian DX-ers Calling".

ENGLISH FROM DENMARK

Radio Denmark at Copenhagen was well known in the 1960's for its popular English broadcasts, but they were discontinued in December 1969. It was realised that old equipment and aerial systems would have to be upgraded and the Danish authorities decided at the time to reduce the use of short-wave broadcasts. This year has found Radio Denmark once again broadcasting in English and, according to "DX Post in Adelaide", the transmissions are heard every Saturday 12 minutes after the opening of transmissions. All broadcasts are on 15165kHz and the transmission times are 0730, 0900, 1200, 1400 and 1930GMT.

DEUTSCHELANDFUNK ON SW

For many years Deutschelandfunk has operated on medium-wave from Cologne with broadcasts in several languages, mainly those of eastern Europe. In order to more effectively reach this audience, portions of their transmission are now being relayed on short-wave by Deutsche Welle. The best reception has been 0530-0630GMT on 7130kHz when a transmission to eastern Europe has been heard. The usual Deutsche Welle interval signal is used for the commencement of the broadcast, but the rest of the transmission is that of Deutschelandfunk from its studios in Cologne.

ENGLISH FROM PRAGUE

Prague has a transmission to Australia and New Zealand in English 0730-0800 and 0830-0900 on 11855, 15395 and 21700. The frequency of 11855 is for reception in Australia and New Zealand and a transmission on Saturday and Sunday 0900-0930GMT is also broadcast for this area.

The latest schedule, valid to November 7, also shows that broadcasts to North America (which are also well received in our afternoons) are on the air 0300-0357GMT on 5930, 7345, 9540, 9630 and 11990kHz. The Inter-Program for travellers in Europe and in Czechoslovakia is broadcast from 0630-1157GMT on 6055 and 9509kHz.

AUSTRALIAN EXPANSION

The recent announcement of the upgrading of the transmitting facilities at Shepparton was followed by the report on the proposed expansion of Radio Australia. This independent inquiry into Radio Australia has recommended the expenditure of $69 million for the upgrading of the overseas broadcasting service over the next six years. The report recommends an expanding role for Radio Australia with extensions and additions to present language services. It also calls for the development of a permanent transmitting station on the North-West Cape of Western Australia to replace a temporary station at Carnarvon.

The government has already announced an expenditure of $2½ million in the coming budget to upgrade Radio Australia transmitters. This will be spent on its Shepparton transmitters in Victoria—the primary transmitting station for the Pacific region.

There are also plans for the possible reconstruction of the Cox Peninsula station near Darwin, which was put out of action on Christmas Day 1974 by Cyclone Tracy.

This transmitting site consisted of four 250kW transmitters and these may be rebuilt or the station moved to an alternative site.

SECOND MALTA OUTLET

A second transmitter is now being used by Adventist World Radio for their Gospel broadcast from Malta. The second transmitter is using 9605kHz on Sundays only between 0700-0800GMT. This frequency in the South Pacific is blocked by Radio Sweden which operates on 9605kHz 0630-0800GMT with a program in Swedish for Australia and New Zealand. The broadcast of Adventist World Radio is also carried on a transmitter at Sines in Portugal and also from another transmitter from Malta on 9745kHz.

It is planned to operate all three transmitters 0600-0800GMT Sundays only, on these three frequencies. The transmitter at Sines is leased from Trans Europe, while those on Malta are operated by Deutsche Welle. The address for reports is Adventist World Radio, PO Box 2590, Lisbon 2, Portugal.

LISTENING BRIEFS

EUROPE

CZECHOSLOVAKIA: According to the BBC Monitoring Service the "Inter-Program" of Radio Prague is now broadcast on short-wave on 6055, 9505 and 9630kHz. The transmissions are in Czech, English, French and German and are on the air 0630-1200 and 2300-0055GMT.

CLANDESTINE: One of the best-known clandestine radio stations, Radio Euzkadi, which operated with the aim of promoting the Basque movement in Spain, has now ceased operation. The station operated for the past 14 years and was widely heard in Australia and New Zealand, confirming reception from an address in Paris. According to the BBC, it is believed that the transmitters which carried this program were located in Venezuela.

USSR: Radio Moscow has a transmission in English for Australia and New Zealand and this is broadcast 0800-1000GMT. The broadcasts are carried on 9780, 11870, 15130, 15380 and 17700kHz.

FINLAND: Broadcasts from Helsinki have been observed on 15265kHz by Douglas Doull of Auckland, NZ, with an English transmission at 2030GMT.

AMERICAS

USA: The Voice of America has re-introduced 21610kHz for the period 2200-2400GMT with programs beamed to Oceania. VOA have replaced 6110kHz from the Philippines at 1100GMT with 15345kHz to this area. As Robert Jones of Sydney remarks, the power is only 50kW and in this area severe jamming is a deterrent to good reception.

The Gospel Station WYFR Oakland, California, has been heard on 6115kHz with an English transmission closing at 0500GMT. The transmission is received at fair strength though when closing there is interference from Vienna, Austria, which is opening a transmission at that time.

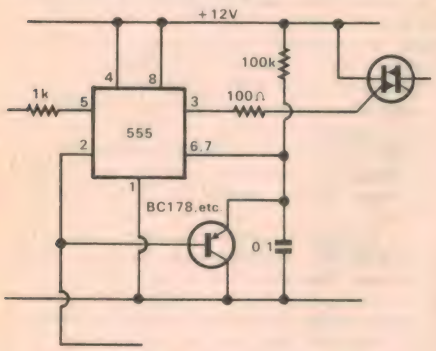
COLOMBIA: Radio Sutentenza has been noted by John Lewry of Newport, Victoria, as providing good reception on 5075kHz. The station was observed from 1010 to past 1100GMT.

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill, NZ. All times are GMT. Add 8 hours for WAST, 10 hours for EAST and 12 hours for NZT.

INFORMATION CENTRE

MUSICOLOUR: I have constructed your Musicolour III and it does not work properly. The lights do not go out completely. I have done some electronic detective work and I have come to the conclusion that this is a design fault. In fact, I fail to see how you ever got this design to work properly.

Allow me to explain. The way your circuit is connected, the Triacs are fired whenever a timing cycle of the 555 timers is allowed to go to completion—fair enough! But what you have apparently failed to realise is that the Triacs are also fired during the time that the 555 timers are forcibly reset via pin 4. Now this is OK as long as the reset pulse applied to pin 4 occurs towards the end of a half cycle. But the way the reset pulse is derived in your circuit, it may be long enough to carry over to the next half cycle. In theory this means that the Triacs will remain turned on at all times; but because of unbalance in the bridge rectifier (from which the reset pulses are derived) it is more likely that on every second half cycle the Triac will be turned on; and this is what was happening in my case.



NOTE: PIN 4 NOW CONNECTED TO +12V

As a remedy I suggest adding a PNP transistor to each 555 timer circuit. This can be done with a few minor changes to the PCB. Pin 4 of each 555 is now connected to the 12V rail. Note that this circuit has a similar method of operation but does not trigger the Triac at all, unless the timing cycle is completed. (G.B., Zillmere, Qld.)

• Er . . . ahem. Yes, there was a design fault. But your diagnosis is incorrect, although your suggested remedy will assuredly work. The fault was high impedance in the reset network causing inadequate "pull-down" of pin 4 of the 555 timers. The cure was suggested in the Notes and Errata for November: "the 10k and 33k resistors at the output of the bridge rectifier should be changed to 330 ohms and 1k respectively." Our prototype did work, and well!

LSI DIGITAL CLOCK: I refer to the CT7001 clock chip used in the Digitronic Model 7010 Calendar Wall Clock reviewed in the July 1976 issue of EA. I was wondering if EA would consider a clock project using the CT7001 chip to the fullest extent of its capabilities, many of which were not used in the Digitronic. These capabilities include 24 hour alarm, snooze alarm, clock radio options, battery backup, and on-chip 50Hz backup circuitry.
(J.M., Carisbrook, Vic.)

• Sorry J.M., but we have no plans to describe another digital clock based on the CT7001 chip. We have, however, described a number of digital clocks which incorporate some of the features that you mention. For example, the design in the November 1975 issue (File No. 7/CL/19) features both alarm and snooze facilities and can be adapted for use as a time switch. Similar facilities were offered on the design in the December 1974 issue (File No. 7/CL/16).

NOTES & ERRATA

VIDEO DATA TERMINAL (February 1977, File No, 2/CC/17): A gremlin crept into the correction published on page 117 of the June 1977 issue. Keyboard scanning line X8 should connect to pin 5 of the encoder IC, not X2.

(continued opposite)

If you are unable to complete an "Electronics Australia" project because you missed out on your regular issue, we can usually provide emergency assistance on the following basis:

PHOTOSTAT COPIES: $2 per project, or $2 per part where a project spreads over multiple issues. Requests can be handled more speedily if projects are positively identified, and if not accompanied by technical queries.

METALWORK DYELINES: Available for most projects at $2 each, showing dimensions, holes, cutouts, etc., but no wiring details.

PRINTED BOARD PATTERNS: Dyeline transparencies, actual size but of limited contrast: $2. Specify positive or negative. We do not sell PC boards.

REPLIES BY POST: Limited to advice concerning projects published within the past 2 years. Charge $2. We cannot provide lengthy answers, undertake special research or discuss design changes.

BACK NUMBERS: Only as available. Within last 6 months, face value. 7-12 months, add 5c surcharge; 13 months or older, add 10c surcharge. Post and packing for 60c per issue extra.

OTHER QUERIES: Technical queries outside the scope of "Replies by Post" may be submitted without fee, for reply in the magazine, at the discretion of the Editor.

COMMERCIAL, SURPLUS EQUIPMENT: No information can be supplied.

COMPONENTS: We do not deal in electronic components. Prices, specifications, etc., should be sought from advertisers or agents.

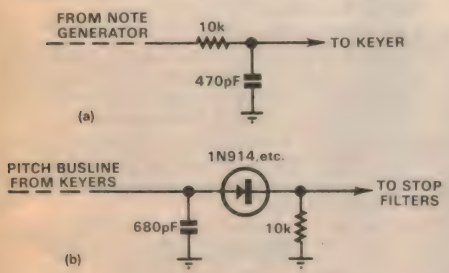
REMITTANCES: Must be negotiable in Australia and made payable to "Electronics Australia". Where the exact charge may be in doubt, we recommend submitting an open cheque endorsed with a suitable limitation.

ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Beaconsfield, 2014.

NOTES & ERRATA, continued

MOS ORGAN KEYERS (August 1976, June 1977; File Nos. 1/EM/41, 1/EM/45): Keyers for the highest notes can exhibit "leak-through" in the off state—particularly those for the higher pitches. This causes an irritating background buzz or whine when stop filters with significant treble response are in use. The cause appears to be stray capacitance, mainly within the 4016 keyer ICs themselves.

A significant reduction can usually be achieved by fitting a "slow-down" RC network between the note generator output and the keyer input, as shown in



(a). An alternative or supplementary approach, suggested by a reader, is to fit a small capacitor and diode to the higher pitch buslines. As shown in (b) the capacitor and diode go between the keyers and the original 10k busline load resistor.

Hifi Review . . . from p.25

frequencies. The subsidiary tone controls provide ±6dB at 50Hz and 20kHz.

Tests for stability with capacitance shunting the loads revealed no problems, nor was there any evidence of transient intermodulation distortion. The amplifier also seems completely immune to RF or mains-borne interference. In short, a clean bill of health.

Phono signal-to-noise ration was 71dB unweighted with respect to full power and a 10mV 1kHz input signal, with a typical cartridge connected. Auxiliary and tuner inputs yielded a S/N ratio of 78dB unweighted with a 4.7k input load. Phono overload was at 300mV at 1kHz and RIAA equalisation was within 0.1dB over most of the range apart from deviations of 0.3dB at 10kHz and 100Hz.

The flawless performance on measurements was confirmed in listening tests. The SA-9500II is very quiet, has loads of power and its sound quality is entirely dependent on the program quality. It's a delight to use, and we are sure any buyer would be justified in considerable pride of ownership.

Recommended retail price is $589. Further information on Pioneer equipment can be obtained from high fidelity retailers throughout Australia. Trade enquiries should be directed to Pioneer Electronics Australia Pty Ltd, 178-184 Boundary Road, Braeside, Victoria or interstate offices. (L.D.S.)

Oscillator . . . from p.55

Accordingly it is best to leave the oscillator switched on until measurements are finished.

3. It is advisable to maintain the supply voltage close to the normal 18 volts; i.e., the batteries are best renewed early before their usual end of life. Cost permitting, nickel-cadmium rechargeable batteries would be excellent for this instrument for the sake of their flat discharge curve.

If it is thought more convenient to have a built-in voltmeter to monitor output, Fig.3 shows a simple voltmeter circuit which will not load the oscillator or distort the waveform. The 50 microamp meter can be set to read 5 volts full scale by adjustment of VR5, having first adjusted VR4 to produce 9 volts DC from the source of the FET to common. Calibration can be done by comparison with the low-voltage AC scale of a VOM or any other suitable AC voltmeter on 50Hz supply, using a potentiometer across a low-voltage secondary of a mains transformer. A 6-volt secondary is very convenient. The 2N4393 junction FET of National Semiconductor Corp. is a good choice for this kind of circuit; other satisfactory types are 2N5459 or MPF102.

The diodes should be germanium types and the OA5 is preferred, giving an almost linear scale down to 0.5 volt RMS. If unobtainable, the OA91 or similar germanium type can be substituted with some loss of linearity, although this is not very important in the present application.

The additional battery drain due to the voltmeter will be 1.8 milliamps.

Marketplace

FOR SALE

DON'T READ THIS if you've got no cents. So you're a big game bargain hunter, off alone into the jungle of electronics, armed only with a soldering iron. Don't be taken for a ride — send for our free guide. SSAE appreciated (small okay). Take along our wild stock list as a guide which includes choice game such as 2c resistors, 6c electrocaps, 6c 1N4148 ($4.50/100, $38/K), 15c zeners, 35c SCRs, 65c triacs, 35c diacs, and many others worth bagging. We'll bag 'em for you — as many as you like for only 40c postage allowance. No minimum quota either. We operate a genuine same day turnaround service.
DIGGERMAN ELECTRONICS, Box 33, Coramba 2466.

BEST PRICE, BEST QUALITY, BEST SELECTION we offer in the component, equipment, Hi-Fi, etc. Write Hong Kong Electronic Bargain Centre—PO Box 2618 Kowloon Central, Hong Kong for free 1977 catalogue.

MEMORIES: 1101-256 bit RAM MOS 16 pin, $2.70; 1103-1024 bit RAM dynamic 18 pin, $3.75; 1702A-2048 bit PROMstatic electrically programmable UV erasable 24 pin, $18.95; 2102-1024 bit RAMstatic 16 pin, $3.90; 5203-2048 bit PROMstatic electrically programmable UV erasable 24 pin, $21.00; 5260-1024 bit RAM MOS dynamic 16 pin, $3.90; 5261-1024 bit RAM MOS dynamic 16 pin, $3.90; 7489 64 bit ROM TTL 16 pin, $2.25; 82S23-256 PROM-SCHOTTKY 16 pin, $7.25; F93410-256 bit RAM bi-polar 16 pin, $3.90; 74187-1024 bit ROM TTL 16 pin, $10.25; 74200-256 bit RAM TRI-STATE 16 pin, $11.00; CENTRAL PROCESSING UNIT 8008, $35.00; 8080A, $34.50; SHIFT REGISTERS: MM5013-1024 bit accum. dynamic, $3.50; MM5016-500/512 bit dynamic, $3.00; SLS-4025 Quad 25 bit, $2.00; 2504-1024 bit multiplexed dynamic, $7.50; NEGATIVE VOLTAGE FOLLOWER: 304—10 to 30 volts, TO-5, $1.60; Voltage Follower: 302-TO-5, $1.10; Voltage Comparator 311 mDip, $1.50; Positive Voltage Regulators: 305— 10 to 40 volts, TO-5, $2.00; 340T series 5V, 6V, 12V & 16 V TO-220, $2.25; 376 10 to 40 volts mDip, $1.10. For 10 or more parts ordered deduct 5%. All parts new and guaranteed. Data sheets supplied upon request with order. Worldwide Electronics, P.O. Box 308, Hornsby 2077.

AUSTRALIAN RADIO DX CLUB. The premier DX Club of Australia now in its 13th year of national operation. Catering for the interests of both S.W. listeners and DXers, the monthly bulletin covers the S.W. and M.W. spectrums. For full details, write enclosing a 20c stamp to ARDXC, P.O. Box 67, Highett, Vic. 3190.

COMPUTING ASSOCIATES. We supply crystals for use in microprocessors, time bases, T.V. games and CB radios. Send us your requirement. P.O. BOX 7973, GENERAL POST OFFICE, HONG KONG.

TELEPRINTER SPECIAL $90 Readers $40. Recording equipment, pre-amps, mon. amps, power supplies, turntable, mics, speakers, mixers, record cutters, tape recorders, plus large variety of electrical, photographic and scientific equipment to be cleared. Send for list of ex Government disposals: Studio 20 Sales, 367 Bourke St, Darlinghurst 2010. Ph. 31 3383.

RESISTORS AND CAPACITORS. Resistors all E12 values. ¼ watt carbon film. 10 ohm to 1 meg 2 cents each I.R.H GL ½ or GLP. ½ watt Metal glaze 10 ohm — 470k 3 cents each or 2.5 cents over 250. 1 watt 1 ohm to 1k 6 cents each or 5 cents over 100 PACKS STANDARD PACK contains 5 each of E12 values in ranges shown. COMPUTER PACK contains quantities based on general usage. ½ watt 285 resistors $7.00. ¼ watt 305 resistors $5.90. CAPACITORS ELECTROLYTICS single ended uprights. Mfd 35 v.w. 1, 2.2, 3.3, 4.7, 10, 22, 10 cents each. 33.47, 15 cents. 25 v.w. 100 16 cents each. 220 25 cents each. 470 35 cents. Polyester Greencaps 100 v.w. .001, .0022, .0033, .0047, .0056, .0068, 7 cents each .01, .022, .033, .047, .056, .068, .082, 10 cents each. .1, .22, 13 cents each. Poly Pack 5 cents of these values $6.00. 75 capacitors. Other components see E.A. June, 1976. All components brand new from manufacturers or agents. Each value of component individually packed. Post and packing included in all orders over $6.50. For orders less than $6.50 add 40 cents for post and packing. 5% discount on orders over $35.00. 10% discount on orders over $75.00. Send orders to RAM ELECTRONICS, 575 Sydney Road, Seaforth, N.S.W. 2092. Please send cheque or money order.

OSCILLOSCOPE BWD, 17" screen, mainframe 1722, triggered time base 17E, high sensitivity differential Amplifier 17D/1, 4 channel amplifier 17B/2, in good condition $700.00. Phone Melbourne (03) 579-1205.

PROJECTS KITS BUILT. If you are interested by the projects described in EA and ETI, but lack the experience or time to build them, I can help. Over a decade of experience in Kit building. Playmaster Twin .25: $129. Musicolour 3: $90. Any audio project undertaken. Custom mixers for discos. Sorry, no mini-computer or logic work, as I don't understand it! For more information and quotes, contact Nick Booth, Sydney 73-4088 evenings.

WANTED

URGENT, C.R.O. Tektronix D43, condition not important provided CRT (GEC 1074H P31) is A-1. E. R. Sluiter (02) 631-8453.

VALVE MANTEL RADIOS, price quantity arrangement by phone (944126) or letter. G. Bracey C/o Exeter P.O. West Tamar, Tas.

DISPLAY ADVERTISEMENTS IN MARKETPLACE are available in sizes from a minimum of 2cm x 1 col rated at $11 per col cm.
CLASSIFIED RATES $2 per line per insertion payable in advance. Minimum two lines.
CLOSING DATE is six weeks prior to the on-sale date. Issues are on sale the first Monday of each month.
ADDRESS all classified orders, copy, enquiries, etc., to: The Advertising Manager, ELECTRONICS Australia, Box 162, Beaconsfield 2014.

Advertising Index

A & R Soanar Electronics Group	101
ACE Radio	112
Anglo Australian Observatory	117
Audio Engineers Pty Ltd	32
Audio Telex Communications Pty Ltd	44
Auditec Australia	98
Australian Government Recruiting	90
Bail Electronic Services	40
British Merchandising Pty Ltd	46
BKX Electronics Supply Service	119
Bright Star Crystals Pty Ltd	111
B.W.D. Electronics Pty Ltd	28
Cema (Distributors) Pty Ltd	66
Classic Radio	100
Clock Disposal Co	118
Convoy International Pty Ltd	26
Cowper Sheetmetal & Engineering	108
C & K Electronics (Aust) Pty Ltd	116
Deitch Bros	114
Dick Smith Electronics Group	8, 36, 72, 73, 96,
Dick Smith Electronics Group	facing 61
Digiton	118
Electrocraft Pty Ltd	34
Electronic Enthusiasts Emporium	78
Electronics Australia	106
Elite Electronics	105
Elliott Machine Tools	119
Elmeasco Instruments Pty Ltd	62
Emona Enterprises	98
Ferguson Transformers Pty Ltd	30
General Electronic Services Pty Ltd	21
Haco Distributing Agencies	OBC
Hagemeyer (Aust)	IBC, facing 60
Harman Australia Pty Ltd	50
Hawthorn Communications Centre	41
Hoskins M. & G.	92
Intag Marketing	34
International Correspondence Schools	7
John Knox Electronics	104
Lafayette Electronics	39
Lanthur Electronics	75
Marconi School of Wireless	95
Master Electronic Services	41
Mercantile Credits	47
Motorola Semiconductors	54
Network Engineering	69
N.S. Electronics Pty Ltd	16
Pacific Communications	19
Paramount Rentals	22,23,68
Philips	2
Philips Elcoma	82
Plessey Australia Pty Ltd	centre spread
RCS Radio	113
Radio Despatch Service	63
Radio Parts Group	45
Reid D.J.	58
Royston Electronics	99, 120
Sanwa Electrical Services	70
Sontron Instruments	71
Sony Kemtron Pty Ltd	IFC
Stotts Technical College	31
S.M. Electronics	118
Tandy International Electronics	42
Technical Book & Magazine Co Pty Ltd	109
Techniparts	70
Teleview	40
Vicom International	38
Video Hi-Fi Centre	54
Warburton Franki Ltd	84
Wireless Institute of Australia	111

WHY YOUR NEXT CASSETTE SHOULD BE A MAXELL UD

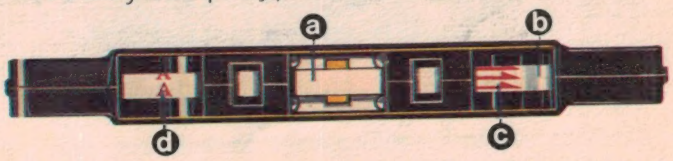
1 THE RESEARCH — More than twenty years ago, Maxell produced their first reel of magnetic tape. At that time, Maxell made a commitment to produce and sell only the finest magnetic products their technology could create.
That commitment still stands today.

2 THE TAPE — This continuous research has lead to the development of the Maxell UD (ultra dynamic) cassette. A tape that has a coating of super-fine PX gamma ferric oxide particles with an extra smooth mirror-finish surface.
All of this adds up to high output, low noise, distortion free performance and a dynamic range equaling that of open reel tapes.

3 THE SHELL — Even the best tape can get mangled in a poorly constructed shell. That's why Maxell protects its tape with a precisely constructed shell, made of lasting heavy-duty plastic.
No fixed guide posts are used. Instead Maxell uses nylon rollers on stainless steel pins thus eliminating the major cause of skipping, jumping and unwinding.
A tough teflon (not waxed paper) slip sheet keeps the tape pack tight and flat. No more bent or nicked tape to ruin your recording.
Maxell doesn't use a welded seal, but puts the cassette together with precision screws. Result — Maxell doesn't jam.

ULTRA-DYNAMIC
UD

4 THE LEADER — A leader tape that has a four function purpose.
a) Non-abrasive head cleaning leader (cleans recording head for 5 secs.).
b) 5 second cueing line (recording function starts 5 seconds after the line appears).
c) Arrows indicating direction of tape travel.
d) A/B side mark (indicates which side is ready for play).



Now you know why your next cassette should be a Maxell UD (ultra dynamic).

maxell®

The sound expert's cassette. UD available in C60, C90 and C120.
Distributed by **Hagemeyer (Australasia) B.V.** Branches in all States.

WT GD 127M

TECHNICS PRESENTS ITS CREDENTIALS.

This state-of-the-art vertically racked hi-fi system represents Technics leadership in audio concepts and technology. Each component in itself reflects the outstanding development of high fidelity equipment available today.
These Technics components have been perfectly matched both in design and specifications to make up a system of superior quality. Its sound will give your listening room concert hall realism.

The system comprises SU8600 stereo integrated amplifier (76 watts per channel, RMS at 1 kHz, 8 ohms); ST9600 AM/FM tuner; SL1300 direct-drive fully automatic turntable (wow and flutter 0.03% WRMS); RS671US two-motor drive, front loading cassette deck with Dolby* noise reduction; and the SB6000 linear-phase speaker system. All components are housed in a new design rack for the total professional look.

WARRANTY AND SERVICE BY HACO

For a National Technics catalogue please write to:
National Technics Advisory Service, P.O. Box 49, Kensington, N.S.W. 2033

DOLBY SYSTEM *Under licence from Dolby Laboratories Inc.

National Technics hi-fi

T77.6